alpha® WSN Wireless Measurement System

User Manual

alpha® WSN SM 240

alpha® WSN SM 240ex

alpha® WSN RM 300

alpha® WSN RM 300-G/
alpha® WSN RM 300ex

alpha® WSN BM 110

alpha® WSN BM 120

alpha® WSN BM 130

Table of contents

Safety precautions 5
Safety precautions for the base module alpha WSN BM 1x0 6
Safety precautions for the sensor module alpha WSN SM 240ex 6
Safety precautions for the repeater module alpha WSN RM 300ex 6
General Instructions 7
General product description 8
Application example wireless measurement system 8
Modules of the wireless measurement system 9
Base module 9
Sensor module 9
Repeater module 10
Description of device-specific features 10
Base modules 10
Functional elements and interfaces 11
Base module with LAN interfaces alpha WSN BM 110 12
Base module with USB interfaces alpha WSN BM 120 13
Base module with WLAN interfaces alpha WSN BM 130 14
Sensor module 15
Versions 15
Functional elements and interfaces 16
alpha WSN SM 240ex / alpha WSN SM 240-G 16
alpha WSN SM 240 17
Connection of the sensors 18
Accuracy alpha WSN SM240ex, alpha WSN SM240 at properly connected measuring sensors 20
Repeater module 20
Versions 21
Functional elements and interfaces 21
alpha WSN RM 300ex / alpha WSN RM 300-G 21
alpha WSN RM 300 22
Connection of the barrier (only alpha WSN RM 300ex) 23
Wiring of the barrier MTL7715+ with power supply unit and repeater 23
Putting the units into operation 25
Delivery status 25
Initial state of the base module after connecting 25
Base module alpha WSN BM 110 25
Base module alpha WSN BM 120 25
Base module alpha WSN BM 130 25

Table of contents

Initial state of the sensor module after starting 26
Initial state of the repeater module after starting 26
Mounting 26
General instructions 26
Mounting instructions for the base module alpha WSN BM 1x0 26
Mounting instructions for the sensor module alpha WSN SM 240ex 26
Mounting instructions for the repeater module alpha WSN RM 300ex 27
Instructions for the operation of the PCB version (alpha WSN SM 230, alpha WSN RM 300) 27
Configuration of the interfaces 28
Setting the RS232 interface or settings at the terminal programme 28
Setting the USB interface 31
Automatic USB driver installation 31
Manual USB driver installation 34
Checking the USB driver settings 38
Link test USB-Port 39
Setting the LAN interface 39
Automatic setting of the IP address 39
Manual setting of the IP address 40
Setting Serial-Port-Profile 40
Further settings of the LAN module 41
Setting the WLAN interface 41
Automatic setting of the IP address 41
Manual setting of the IP address 42
Setting Serial-Port-Profile 42
Setting the encoding 43
Further settings of the WLAN module 43
Searching for modules by means of Discovery-Tool 43
Control software and software interface 45
Control software alpha data view 45
Installation of the control software alpha data view 45
Short description of the control software alpha data view 45
Setting the sensor parameters 46
Selecting alarm criteria for all sensors 47
Software interface 48
Protocol description 48
Messages from the base module to the PC 48
Messages from the PC to the base module 49
Overview of commands 50

Table of contents

Description data bytes 52
Setting the measuring interval 54
Setting the minimum and maximum capacities 55
Login procedure PC at the base module 58
Login procedure 59
Logout procedure 61
CRC calculation 62
Maintenance and inspection 63
Base module 63
alpha WSN BM 110, BM 120, BM 130 63
Sensor module 63
alpha WSN SM 240ex 63
alpha WSN SM 240 63
Repeatermodul 63
alpha WSN RM 300ex 63
alpha WSN RM 300 63
Maintenance 64
Base module alpha WSN BM 1x0 64
Sensor modules alpha WSN SM 240ex and alpha WSN SM 240 64
Repeater modules alpha WSN RM 300ex and alpha WSN RM 300 64
Battery change 64
Battery change housing version 64
Battery change PCB version 65
Troubleshooting 66
Base module alpha WSN BM 1x0 66
Sensor module alpha WSN SM 240ex and alpha WSN SM 240 67
Repeater module alpha WSN RM 300ex and alpha WSN RM 300 67
Antennas 67
Technical data 68
General 68
Base module 68
Sensor module 69
Repeater module 69
Declaration of conformity 70
Glossary 70

Safety precautions

Attention!

- **The relevant regulations for installation and operation of electrical installations have to be observed (e. g. RL 1999/92/EG, RL94/9EG, ElexV, IEC/ EN 60 079-14 and VDE 0100).**
- **The operator of an electrical installation in an explosion-endangered environment has to keep the equipment in proper condition, duly operate it, control it and to carry out maintenance as well as repair works (ElexV and EN 60 079-14).**
- **The following applies for units approved for use explosion-endangered environment (SM 240ex, RM 300ex): In case the ignition protection type is concerned, only original parts of the manufacturer may be used for exchange (e. g. parts of the housing).**
- **The detailed knowledge and the technically correct realization of the installation guidelines, safety precautions and functions described in this user manual are essential to the safety of the operation.**
- **The safety of the product requires an appropriate transport, an appropriate storage, installation and operation.**
- **Interference in the product may only be effected by qualified personnel that is familiar with the user manual.**
- **When observing the handling instructions and the safety-related instructions, no dangers regarding damages to properties and to persons come from the product in normal case.**
- **Only use the unit for the allowed application. Mind the EC-type examination certificate.**
- **Faulty or improper use as well as the noncompliance with the instructions of this user manual exclude a warranty by the manufacturer.**

ESD protection measures

Comply with the ESD protection measures according to DIN EN 61340-5-1/2 when opening the unit (potential equalization between body and ground of the unit as well as ground of the casing via high-value resistance (approx. 1 MOhm) e. g. by means of a usual wrist band).

Safety precautions

The following regulations have to be observed:

- **national safety regulations**
- **national rules for the prevention of accidents**
- **national regulations for mounting and installation**
- **generally approved rules of the technique**
- **safety precautions of this user manual**
- **characteristic values and measuring operating conditions of the type and data plates**
- **additional signboards on the unit**

Avoid to touch conductive parts of the unit.

Do not open the unit, only permit repairs by the manufacturer.

Mind the valid legal provisions for the protection of persons in electromagnetic fields when installing the antenna.

For units that are approved for use in explosion-endangered environment (SM 240ex, RM 300ex) the following applies:

Damages may neutralize the explosion protection. In case of recognisable damages, the unit has to be send to the manufacturer for repairing.

Safety precautions for the base module alpha WSN BM 1x0

Do not use or install the unit in rooms with explosive materials.

Only use an unshielded Twisted Pair cable (UTP) when connecting the LAN interface of the alpha WSN BM 110!

Do not cover the base module.

When operating the base module over USB or Power over Ethernet, no power supply unit may be connected.

Safety precautions for the sensor module alpha WSN SM 240ex

The sensor module is approved for operation in zone 1 and 2 (94/9/EG).

Only open the sensor module and change the battery outside of the explosion-endangered zone.

In case a battery is inserted, no power supply unit may be connected and the battery has to be removed in case of operation via power supply unit.

Safety precautions for the repeater module alpha WSN RM 300ex

The repeater module is approved for operation in zone 1 and 2 (94/9/EG).

Only open the repeater module outside of the explosion-endangered zone.

The power supply from the power supply unit may only be connected to the repeater module in dead condition.

In case a battery is inserted, no power supply unit may be connected and the battery has to be removed in case of operation via power supply unit.

General Instructions

The wireless measurement system can be operated in countries of the European Union (EU). Outside the EU, the national regulations of the respective country apply. Only use antennas that are designated for the frequency range, since otherwise, the operating license expires and you have to expect appropriate sanctions.

The following applies for units that are approved for operation in explosion-endangered environment (SM 240ex, RM 300ex):
The unit is approved for the operation in zone 1 and 2 in the range of the directive 94/9/EG.

Damages to devices or people that are caused due to the use of our units during malfunction or normal operation according to our documentation or instructions in any form, are explicitly excluded from liability.

As well excluded are recourse receivables that can occur indirectly or directly because of the fault of the manufacturer (delay in delivery, malfunctions, that can occur in the period of guarantee etc.).

Each customer has the opportunity to obtain test units for a system integration test. The test units are in function equivalent to the standard set (except the standard sets have better features due to state of the art). The customer has to meet the costs for all necessary adaptations (software as well as hardware). This is particularly applicable in case the customer did not make use of a test unit.

Furthermore, our general terms and conditions apply.

Read the user manual carefully to be able to use the wealth of features of your new Wireless Measurement System.

Information regarding the used trademarks

Microsoft® and Windows® are registered trademarks of the Microsoft Corporation. All other trade and product names are trademarks or registered trademarks of the respective companies.

General product description

The wireless measurement system consists of one base module and at least one sensor module. The sensor modules can be equipped with up to 6 temperature measuring sensors (PT1000).
This base module is linked with a PC or IP network by means of different interfaces, depending on the type of base module.
For the display of the measured values and events and for the setting of the parameters of the sensor modules, the PC software alpha data view is available.

Application example wireless measurement system

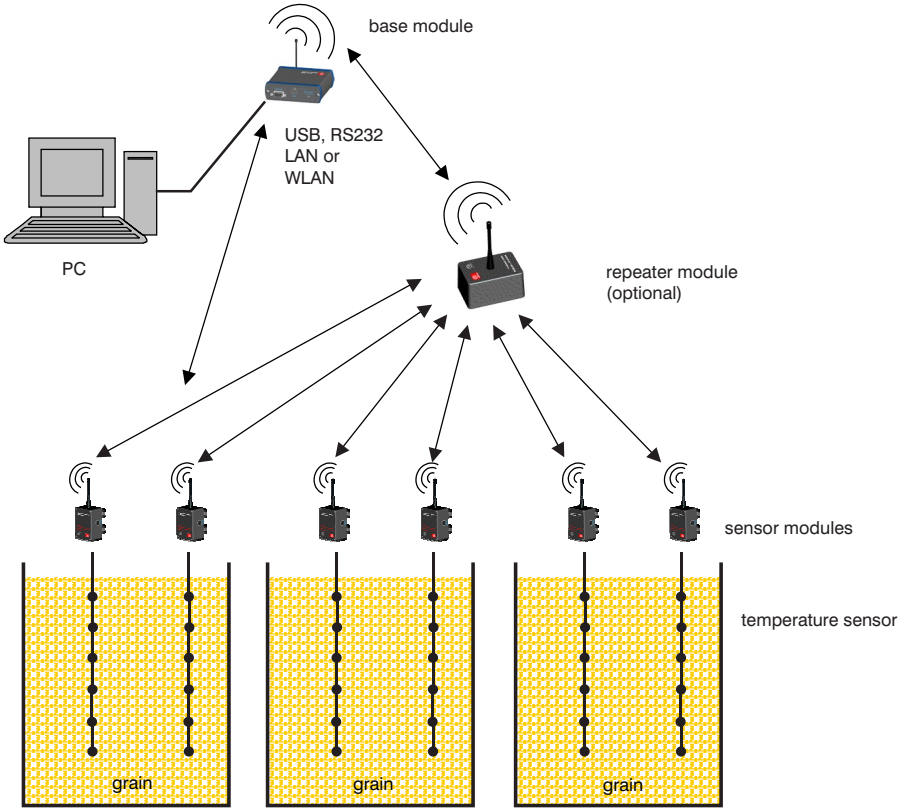


Fig. Storehouse for grain

Product description

The temperature monitoring in storehouses for grain is mostly still done manually, this means that every measuring point is controlled by an employee at least once a day. This procedure is very cost and time consuming.
The solution is the wireless measurement system. Every measuring point can be equipped with up to six temperature measuring sensors. So it can be used area-wide in storehouses for grain, storehouses for bulk goods or similar warehouses. Depending on the measuring interval, a total of up to several hundred measuring points is possible. In order to be able to achieve a sufficient radio coverage or higher ranges, repeaters can be used. They extend the operational range of the wireless measurement system by far.

Modules of the wireless measurement system

Base module

The base module receives the transmitted data of the sensor modules and transfers these over a RS232, USB, LAN or WLAN interface to a PC or an IP network.
The RS232 interface is available at all module versions.
The LAN or WLAN interfaces make the connection to an Intranet or to the Internet possible and therewith the worldwide inquiry of the measurement data.

At the combination LAN / RS232 (alpha WSN BM 110), the voltage supply will be realized over an external pluggable power supply unit or over the LAN connection (PoE – Power over Ethernet) if an appropriate PoE voltage supply is installed in the LAN.

At the combination USB / RS232 (alpha WSN BM 120), it is possible to realize the voltage supply over the USB interface. Alternatively, the voltage supply can also be realized over a power supply unit.

At the combination WLAN / RS232 (alpha WSN BM 130), the voltage supply has to be realized over an external power supply unit.

Sensor module

The sensor module is for the connection of different sensors.
The acquired data is transmitted to the base module by radio and from there, they are transferred to a PC.
An inquiry as well as setting of the parameters of the sensor modules from base module (polling) is also possible.
The voltage supply is realised over an internal 3.6 V battery (lithiumthionylchloride, size 2/3 A). In case the battery voltage is falling below the minimum battery voltage, a message is sent to the base station. The battery should be changed then. An intelligent power management guarantees a long battery lifetime up to several years (depending on the size of the network, the propagation conditions and the measuring interval).

Repeater module

The repeater module is for the transmission of the sensor data to the base module. It is used in case of difficult radio propagation conditions or in case the distances between sensor and base module are too great.
The voltage supply is realized via an external power supply unit.
A voltage supply over an internal 3.6 V battery (lithiumthionylchloride, size LR14) is possible, but it is not recommended because of the higher power demand of the repeater module.

Description of device-specific features

Base modules

The base modules of the wireless measurement system are the interface to the PC world or an IP network. They receive the data of the single sensor modules and transfer them to a PC. Connections over RS232, USB, LAN or WLAN are available for this.
The base module can temporarily store up to approx. 45,000 sensor data sets. In case of a temporary termination of the visualization software or switching off of the PC, the sensor data is so buffered and is not lost.
After starting the visualization software again, the data is transmitted to the PC.
Furthermore, the base module is equipped with two potential-free outputs (change-over contacts) that can be controlled from the PC, if required (alarm signalling).
There are two LEDs at every base module. The green LED indicates the operation of the module (glowing when the module is active) and the red LED indicates correctly transmitted and received packets of data.

Status LED (red) glowing for approx. 50 ms:	packet of data transmitted correctly
Status LED (red) glowing for approx. 500 ms:	packet of data received correctly

Functional elements and interfaces

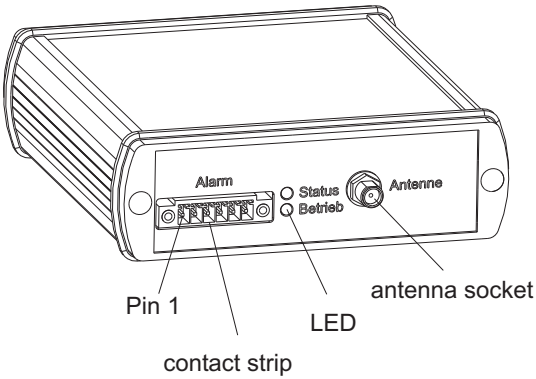


Fig.: Functional elements BM 110, BM 120, BM 130

All base modules have a standardised socket board with potential-free outputs. These can e. g. be used as alarm outputs. The control is realized over the visualization software alpha data view. This interprets the received data and sends a command for the activation of the alarm outputs to the base module, if required. Following, the Pin assignment of the socket board is described.

Pin	Designation	Function
1	K1-C 2	relay switch 2 normally closed contact
2	K1-C 1	relay switch 2 central contact
3	K1-C 3	relay switch 2 normally open contact
4	K1-B 3	relay switch 1 normally open contact
5	K1-B 1	relay switch 1 central contact
6	K1-B 2	relay switch 1 normally closed contact

Table: Pin assignment of the socket board at all base modules

Designation	Function
Interior contact	signal
External contact	ground

Table: Assignment of the antenna socket

Colour	Function
red	status
green	operation

Table: Assignment of the LEDs

Base module with LAN interfaces alpha WSN BM 110

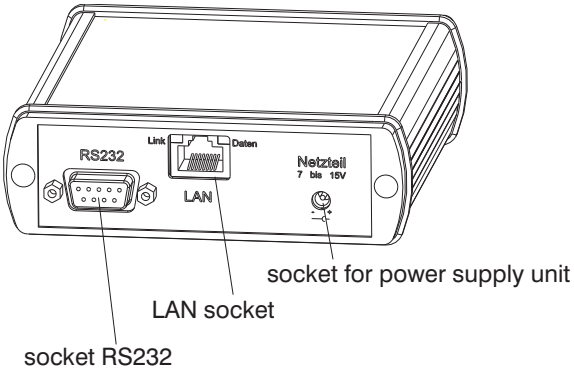


Fig.: Functional elements BM 110

Pin	Designation	Function
1	N.C.	not connected
2	RXD	received data
3	TXD	transmission data
4	N.C.	not connected
5	GND	ground
6	N.C.	not connected
7	N.C.	not connected
8	N.C.	not connected
9	N.C.	not connected

Table: Pin assignment of the RS232 socket

Pin	Designation	Function
1	Tx+	transmission data
2	Tx-	transmission data
3	Rx+	received data
4		PoE 1
5		PoE 1
6	Rx-	received data
7		PoE 2
8		PoE 2

Table: Pin assignment LAN socket

Designation	Function
Interior contact	positive supply voltage
External contact	ground

Table: Assignment of the power supply unit socket

Base module with USB interfaces alpha WSN BM 120

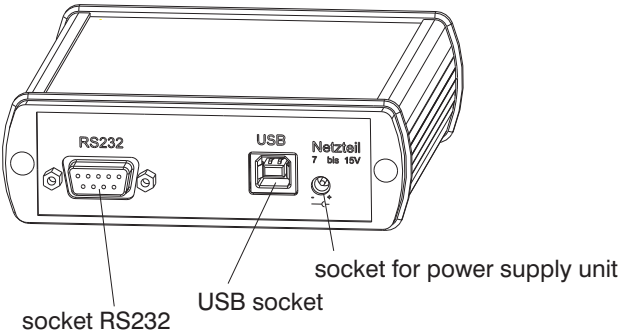


Fig.: Functional elements BM 120

Pin	Designation	Function
1	N.C.	not connected
2	RXD	received data
3	TXD	transmission data
4	N.C.	not connected
5	GND	ground
6	N.C.	not connected
7	N.C.	not connected
8	N.C.	not connected
9	N.C.	not connected

Table: Pin assignment of the RS232 socket

Pin	Designation	Function
1	VCC	+5 V supply voltage
2	D-	data
3	D+	data
4	GND	ground

Table: Pin assignment USB socket

Designation	Function
Interior contact	positive supply voltage
External contact	ground

Table: Assignment of the power supply unit socket

Base module with WLAN interfaces alpha WSN BM 130

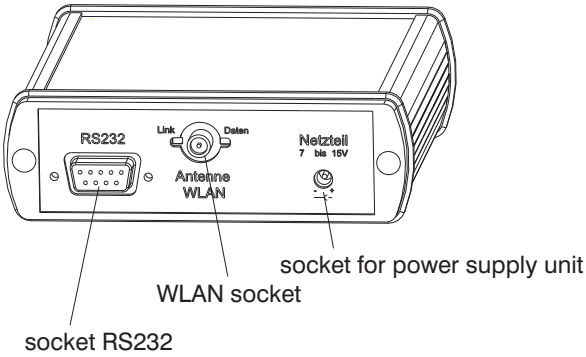


Fig.: Functional elements BM 130

Pin	Designation	Function
1	DCD	received signal detected
2	RXD	received data
3	TXD	transmission data
4	DTR	terminal ready
5	GND	ground
6	DSR	readiness for operation
7	RTS	activate transmit unit
8	CTS	ready to send
9	N.C.	not connected

Table: Pin assignment of the RS232 socket

Designation	Function
Interior contact	signal
External contact	ground

Table: Assignment WLAN-antenna socket

Designation	Function
Interior contact	positive supply voltage
External contact	ground

Table: Assignment of the power supply unit socket

Description of device-specific features

Sensor module

Up to six PT1000 measuring sensors 2-wire technology can be connected to the sensor module.
By using PT1000 measuring sensors, errors because of line length and temperature coefficients of the cable from the measuring sensor to the sensor hardly have an effect on the measuring result.
The automatic length correction makes the connection of cables with a resistance of up to 2.8 Ohm for go-and-return line possible. It is important that all cables have the same cross section and the same length and that they are connected as described in the following paragraphs.
The sensor modules have a switching off function that is controllable over the sensor interface. So it is made sure that the sensor module only transmits data by radio in case sensors are connected. Two switching contacts are available which have to be connected to switch on the sensor module. This can be done by means of a switch or also by means of a solder bridge in the plug.
The sensor module alpha WSN SM 240ex is available in an IP65 housing (explosion-protection zone 21), the sensor module alpha WSN SM 240-G is available in an IP65 housing, the sensor module alpha WSN SM 240 is available as pcb version.
The user can determine the measuring interval of every single sensor module in the range of 10 s…1 year. The respective sensor module always sends latest measured values after expiration of this time (also see chapter "Control software and software interface").
Furthermore, maximum / minimum capacities can be set for every measuring sensor of every sensor module. The sensor module only transmits valid measuring values when these are within this range. In case a value outside of this range is measured, an invalid measured value (0x0000) is sent, the same applies to sensors that are connected wrongly or defective sensors. See also chapter "Operating software and software interface".

Versions

The sensor module of the wireless measurement system is available in three versions:

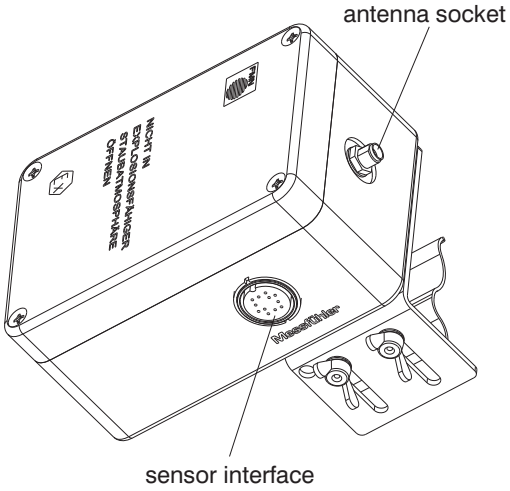
- alpha WSN SM 240ex → for operation in explosion-endangered areas
- alpha WSN SM 240 → pcb version of the sensor module for universal use
- alpha WSN SM 240-G → housing version of the alpha WSN SM 240, but not for the operation in explosion-endangered areas

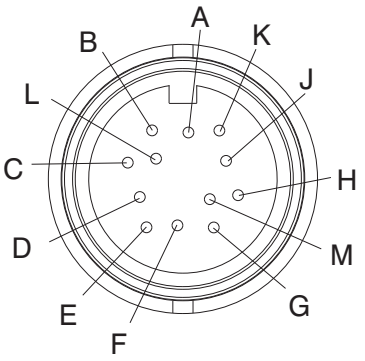
The modules alpha WSN SM 240ex and alpha WSN SM 240 are described in detail in this user manual. The housing version alpha WSN SM 240-G is not described further. Technically, it corresponds to the sensor module alpha WSN SM 240ex, but it is not suitable for the operation in explosion-endangered areas!

Description of device-specific features

Functional elements and interfaces

alpha WSN SM 240ex / alpha WSN SM 240-G





PIN assignment sensor interface

Fig.: Functional elements SM 240ex, SM 240-G

Designation	Function
F	on / off contact 1
E	on / off contact 2
D	PT1000 measuring sensor 1
K	PT1000 measuring sensor 2
L	PT1000 measuring sensor 3
C	PT1000 measuring sensor 4
A	PT1000 measuring sensor 5
B	PT1000 measuring sensor 6
J	Ground for all measuring sensors
H	Coding input 1 for line length correction
M	Coding input 2 for line length correction
G	Coding input 3 for line length correction

Table: Assignment sensor interface

Designation	Function
Interior contact	signal
External contact	ground

Table: Assignment of the antenna socket

alpha WSN SM 240

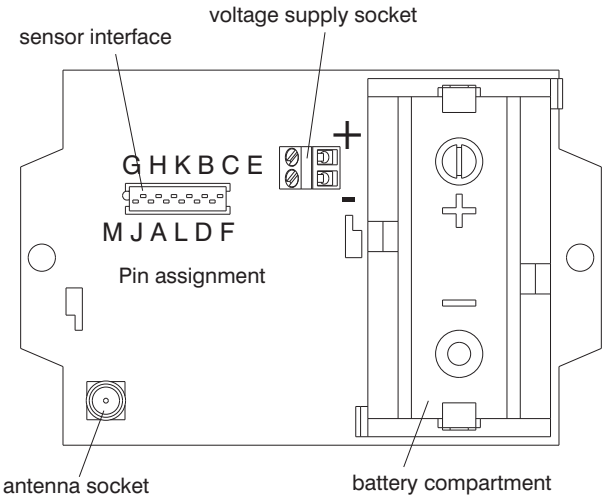


Fig.: Functional elements SM 240

Designation	Function
F	on / off contact 1
E	on / off contact 2
D	PT1000 measuring sensor 1
K	PT1000 measuring sensor 2
L	PT1000 measuring sensor 3
C	PT1000 measuring sensor 4
A	PT1000 measuring sensor 5
B	PT1000 measuring sensor 6
J	Ground for all measuring sensors
H	Coding input 1 for line length correction
M	Coding input 2 for line length correction
G	Coding input 3 for line length correction

Table: Assignment sensor interface

Designation	Function
Interior contact	signal
External contact	ground

Table: Assignment of the antenna socket

Designation	Function
+	positive supply socket
-	ground

Table: Assignment power supply socket

Connection of the sensors

The interfaces described in the previous paragraphs are available for the connection of the sensors. At the sensor module alpha WSN SM240ex, this is the 12-pole connector at the outside of the housing, at the alpha WSN SM 240, it is the connector on the pcb. The pins E and F are the two switching contacts. These have to be connected in order to activate the sensor module.
The connection J is the common mass connection for all PT1000 measuring sensors. In order to achieve a high accuracy, all return conductors of the measuring sensors should only be brought together at this point.
Basically, it is also possible to use a very low-resistance return conductor and to bring the ground of the measuring sensors together elsewhere.

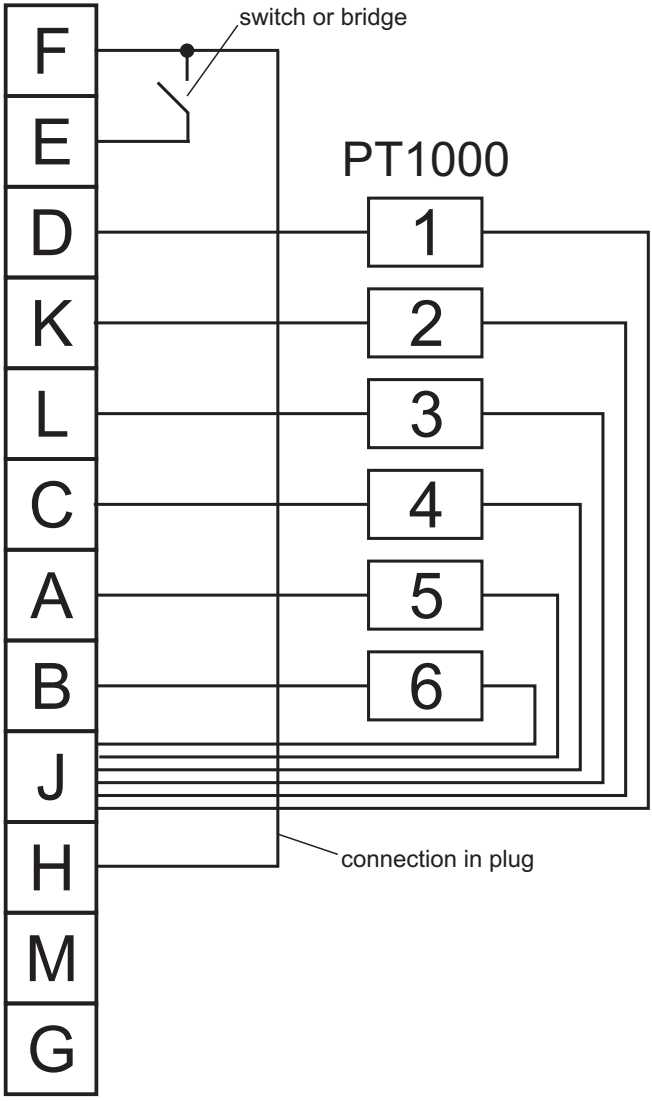
At the coding inputs H, M and G, the length of the cable and its resistance is compensated by means of bridges. Over the specific resistance, the length and the cross section of the wires to the measuring sensors, the resistance to be set can be calculated as follows:

R = ρ*l/A = 0017Ω*mm^2/m *l/A (for copper)
R = resistance in Ω
ρ = specific electrical resistance in Ω*mm^2/m
l = length of the cable in m (add go-and-return line)
A = cross section of the wires to the measuring sensors in mm^2

Resistance in Ω (go-and return conductor)	Coding input 3 G	Coding input 2 M	Coding input 1 H
0.0 Ω ... 0.2 Ω	0	0	0
0.2 Ω ... 0.6 Ω	0	0	1
0.6 Ω ... 1.0 Ω	0	1	0
1.0 Ω ... 1.4 Ω	0	1	1
1.4 Ω ... 1.8 Ω	1	0	0
1.8 Ω ... 2.2 Ω	1	0	1
2.2 Ω ... 2.6 Ω	1	1	0
2.6 Ω ... 3.0 Ω	1	1	1

Table: Coding line resistance

All coding inputs are automatically set to "1". In order to create a "0" at a coding input, this has to be connected with the connection F in the plug by means of a bridge.
Example:
Cable length = 10 m (go-and-return line = 20 m), copper
Cross section = 0.14 mm^2
R = 0.017*20 m / 0.14 mm^2
R = 2.43 Ω (is between 2.2 Ω ... 2.6 Ω)
According to the table, the conding input 1 (H) has to be set to 0, this means be bridged with connection F. G and M are not connected.
In this way, measuring sensors with a cable lengths of up to 12 m at
0.14 mm^2 and 19 m at 0.22 mm^2 cross section can be used.



Example for the connection of 6 measuring sensors PT1000 at a cable length of 10 m (go-and-return line 20 m) with copper wire 0.14 mm² cross section.

Accuracy alpha WSN SM240ex, alpha WSN SM240 at properly connected measuring sensors

The sensor modules are a compromise of efficiency and accuracy. In order to be able to connect as much sensors as possible at the compactness of the module as well as of the connectors, only a 2-wire wiring was chosen as type of connection. In order to achieve a high accuracy nevertheless, a line compensation is effected in the sensor module. Thus, the disadvantages of the 2-wire wiring (resistance of the cable is regarded as measuring error) can be eliminated to a large extend, particularly also in case of large line lengths.

alpha WSN SM 240ex or alpha WSN SM 240 at:	Unit without measuring sensor		Unit with measuring sensor, 12 m 0.14 mm² cable, PT1000 1/3B	
	Typ.	Max.	Typ.	Max.
Normal temperature (15 °C to +35 °C)	+/- 0.3 °C	+/- 0.5 °C	+/- 1.0 °C	+/- 1.5 °C
Extreme temperature (-25 °C to +75 °C)	+/- 0.6 °C	+/- 1.0 °C	+/- 1.5 °C	+/- 2.0 °C

Table: Overview measurement accuracy

Every 5 years, the sensors SM 240ex and SM 240 should be calibrated anew.

Repeater module

The repeater module has the function to transfer the data within the network. In case a sensor module is too far away from a base module to reach it directly, the range can be raised by using a repeater. Thereby, it is possible to set up spatially long-range networks by means of sensor modules with low transmitting power. This raises the energy efficiency and therewith considerably raises the lifetime of the battery.
The repeater modules have to send more often than sensor modules and have to be ready to receive all the time since they possibly transmit packets of data of several sensor modules. They are as a rule firmly installed at topological favourable points and are fed by a power supply unit. In case of need, battery operation is also possible over a short period of time.
The repeater module alpha WSN RM 300ex is available in an IP65 housing (explosion protection zone 21), the repeater module alpha WSN RM 300-G is available in an IP65 housing, the repeater module alpha WSN RM 300 is available as pcb version.
The repeater alpha WSN RM 300ex may only be operated in connectin with the approved barrier MTL7715+ and the required, shielded cable in the explosion-endangered area.
When powering the alpha WSN RM 300 by means of a power supply unit, you have to make sure that no battery is inserted in the unit.
At the consturction of the network, you have to make sure that the number of repeaters in the network is kept low in order not to excessively stress the network because of multiple packet forwardings.
When setting up the network, you have to mind that the number of repeaters in the network is kept low in order not to stress the network excessively by manifold packet forwarding.

Description of device-specific features

Repeaters should also be installed in places with good radio propagation conditions (e. g. isolated, elevated mounting places). This raises the range and the quality of the whole network.

Versions

The repeater module of the wireless measurement system is available in three versions:

- alpha WSN RM 300ex → for the operation in explosion-endangered areas
- alpha WSN RM 300 → pcb version of the repeater module for universal use
- alpha WSN RM 300-G → housing version of the RM 300, but not for use in operation in explosion-endangered areas

The modules alpha WSN RM 300ex and alpha WSN RM 300 are described in detail in this user manual. The housing version alpha WSN RM 300-G is not specified. Technically, the housing version corresponds to the repeater module alpha WSN RM 300ex, but it is not suitable for the operation in explosion-endangered areas!
Keep in mind that you do not have to use a barrier for the connection of the repeater module alpha WSN RM 300-G. A universal power supply unit with the required parameters can be used.

Functional elements and interfaces

alpha WSN RM 300ex / alpha WSN RM 300-G

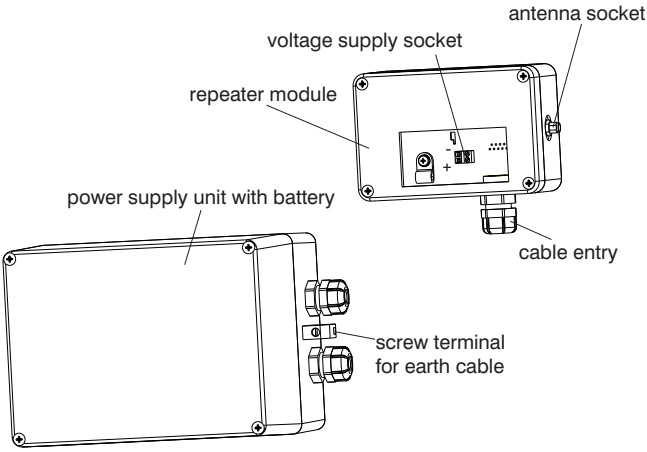


Fig.: Total view repeater with power supply unit and barrier

Designation	Function
Interior contact	signal
External contact	ground

Table: Assignment of the antenna socket

Designation	Function
+	positive supply socket
-	ground

Table: Assignment of the voltage supply socket

alpha WSN RM 300

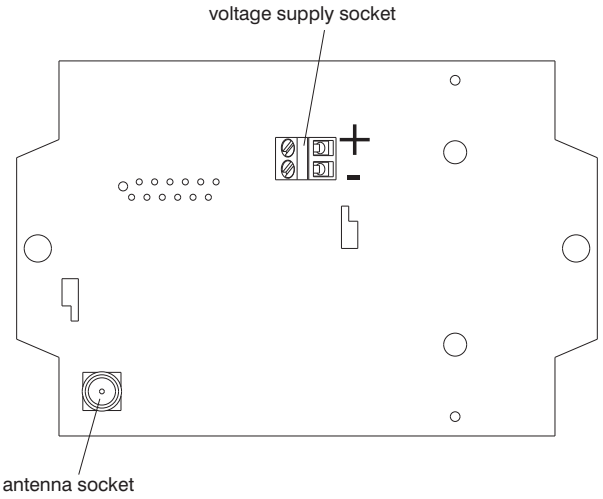


Fig.: Functional elements RM 300

Designation	Function
Interior contact	signal
External contact	ground

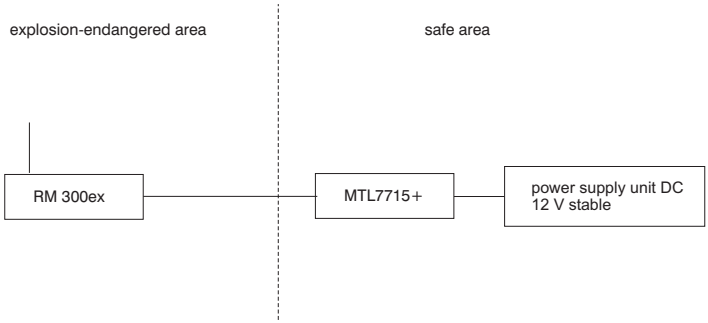
Table: Assignment of the antenna socket

Designation	Function
+	positive supply socket
-	ground

Table: Assignment voltage supply socket

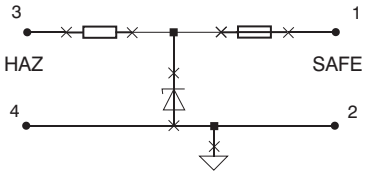
Connection of the barrier (only alpha WSN RM 300ex)

The barrier 7715+ of the company MTL makes sure that no dangers because of defects (e. g. of the power supply unit) pass into the explosion-endangered area.
You have to make sure that the barrier in the secure area, this means outside of the explosion-endangered zone, is connected properly and is also earthed.
As power supply unit, only stabilized types with a fixed output voltage (DC) of 12 V (+/-5 %) and at least 100 mA may be used.



Wiring of the barrier MTL7715+ with power supply unit and repeater

The barrier MTL7715+ has four connections (see fig.) and is suitable for top hat rail mounting.
It is approved for the temperature range from –20 °C up to +60 °C and may only be operated in this area.



TERMINAL 1: +12 V power supply unit (safe area)
TERMINAL 2: 0 V power supply unit (safe area)
TERMINAL 3: + RM 300ex
TERMINAL 4: 0 V RM 300ex

Fig.: Circuit diagram barrier MTL7715+

Description of device-specific features

It is absolutely necessary that the barrier MTL7715+ is earthed according to the instructions. The earth cable 4 mm² (12 AWG) is connected to the screw terminal at the housing of the power supply unit.
The maximum earth resistance and the instructions have to be taken from the description of the barrier.
Only the approved type of cable (Lapp Öflfex EBCY) with a max. length of 20 m may be connected to the connections 3 and 4 of the barrier. This cable with the type of protection instrinsic safety "i" is especially suitable for the use in explosion-endangered areas.
The shielding of this cable is connected with the screw terminal below the connections 3 and 4.
At the side of the repeater, the shielding stays open which means that it is electrically not connected with the repeater.

The wire 1 that is connected to terminal 3 of the barrier is connected with the positive terminal of the voltage supply socket of the repeater. The wire 2 that is connected to terminal 4 of the barrier is connected with the negative terminal of the voltage supply socket of the repeater.

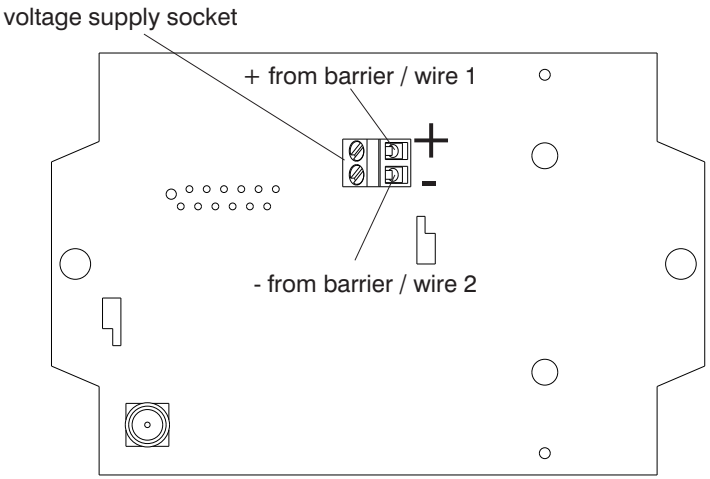


Fig.: Connection barrier MTL7715+

The provided cable Lapp Ölflex EBCY is suitable for flexible applications at free motion without tensile load and without compulsory motion control as well as for fixed laying in dry, damp and wet rooms, but it is not suitable for outdoor use.
In case a laying of the cables in the outdoor area should be necessary, it is recommended to use a protective tube.
In case of fixed laying, the cable may be used in the temperature range from -30 °C up to +80 °C, otherwise it is approved for the temperature range from -5 °C to +70 °C.

Putting the units into operation

Delivery status

The RS232 interface of the base modules and the virtual COM-Port of the base module alpha BM 120 (USB-Port) are set to the parameters 115.200 baud, 8 data bits, no parity bit, 1 stop bit.
The setting of the virtual COM-Ports at the base module alpha BM 110 and alpha BM 130 is carried out similar to this.
The measuring interval of the sensor module is set to 8 hours.
The measuring range of the sensors is set to the range -40 °C ... 110 °C.

Initial state of the base module after connecting

All base modules can be connected to a PC by means of a serial cable.
An external voltage source is required for the power supply. For this, the base modules are equipped with a socket for the connection of an external power supply unit. After connecting the power supply unit to the RS232 cable, the base module automatically switches to receive mode.

Base module alpha WSN BM 110

In case the base module is connected to a PC over a LAN connection, an external voltage source has to be used for the power supply. For this, the base module is equipped with a socket for the connection of an external power supply unit.
An exception is the possibility of voltage supply over the LAN connection, in case the LAN is equipped with an appropriate voltage source 802.3af mid span power pass-through (PoE=Power over Ethernet). After connecting the power supply unit and a LAN cable or only a LAN cable in case of PoE feeding, the base module automatically switches to receive mode. In case of voltage supply of the LAN module over Ethernet, the power supply unit should be separated from the unit.

Base module alpha WSN BM 120

In case the base module is connected to a PC by means of an USB cable, no external power supply unit is necessary. The base module is automatically energised over the USB port. After connecting the USB cable, the base module automatically switches to receive mode. In case the base module is connected with a PC over USB, no power supply unit should be connected.

Base module alpha WSN BM 130

In case the base module is connected to a PC over a WLAN connection, an external voltage source has to be used for the power supply. For this, the base module is equipped with a socket for the connection of an external power supply unit. After connecting the power supply unit, the base module automatically switches to receive mode.

Putting into operation

Initial state of the sensor module after starting

Insert the battery according to the polarity at the sensor module.

Please note: Wrong polarity can lead to the destruction of the unit!

After inserting the battery into a sensor module and connecting the sensor plug, this sensor module independently starts to send its measurement data to the base station in a preset interval.

Initial state of the repeater module after starting

After connecting the power supply unit or after inserting the battery, the repeater module automatically switches to receive mode and forwards the received data.

Please note: Wrong polarity can lead to the destruction of the unit!

Please note:
Connect the cable of the power supply unit with the correct polarity!

Mounting

General instructions

Please read the chapter "Antennas" before mounting the units to walls, ceilings or into housings!

Mounting instructions for the base module alpha WSN BM 1x0

The base module has to be operated in the indoor area. You just have to mind good propagation conditions, this means that the antenna should not be restricted in receiving in the direction of the sensors. The base module should not be covered and not be exposed to direct sunlight.

Mounting instructions for the sensor module alpha WSN SM 240ex

The sensor module may only be operated in the marked protection zones. For mounting, only use the supplied mounting material. The mounting has to be carried out that way that the housing of the sensor module is in no case opened within the explosion-endangered area. All maintenance (e. g. changing of batteries) may only be carried out outside of the explosion-endangered area! Do not operate the sensor module without antenna!

Mounting instructions for the repeater module alpha WSN RM 300ex

The repeater module may only be operated in the marked protection zones. For mounting, only use the supplied mounting material. The mounting has to be carried out that way that the housing of the repeater module is in no case opened within the explosion-endangered area. All maintenance (e. g. changing of batteries, connection of the barrier) may only be carried out outside of the explosion-endangered area! Do not operate the repeater module without antennas!
Mind the correct installation of the barrier! You will find a detailed description in the chapter "Connection of the barrier".

Instructions for the operation of the PCB version (alpha WSN SM 230, alpha WSN RM 300)

When operating the PCB version with the provided standard antennas, you have to mind that the antennas need a counterpoise. This means that the antenna has to be mounted on a conductive base that needs a conductive connection to the ground. This base should have the shape of a cross (length of every leg approx. 15 cm) and the antenna should be mounted in the middle. But you can also use a full surface of the same size.
In case the base is reduced, you will have to expect a deterioration of the propagation conditions. By this, the efficiency of the wireless measurement system, especially the efficiency of the range, is restricted.
Furthermore, you should bear in mind that, especially at operation with the power supply unit with voltages higher than 15 V, there has to be sufficient circulation of air and there may be no extremely high temperatures at the place of installation.

Please note:

The following applies to all units alpha WSN SM 230 and alpha WSN RM 300:

During operation with the power supply unit, no battery may be inserted into the unit!

Configuration of the interfaces

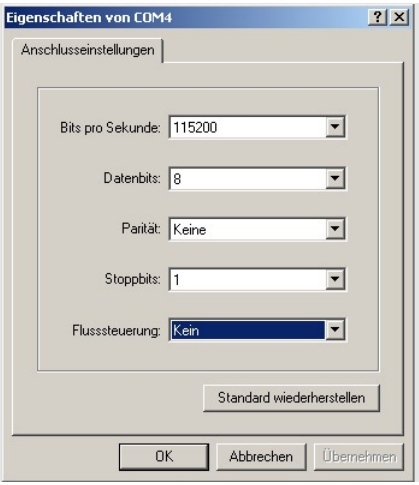
Setting the RS232 interface or settings at the terminal programme

In case your computer has a free COM-Port (9-pole), you can use this connection for the connection with the base module. Then it will not be necessary to install additional drivers.
The parametrisation can be done with any terminal programme.
The manufacturer recommends to use the programme Hyperterminal from Microsoft Windows.

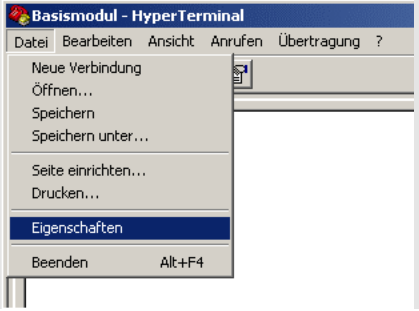
1.	Start the programme Hyperterminal via: Start → Programme → Zubehör → Kommunikation → Hyperterminal Enter a name for the connection that is to be established anew. Here e. g. “Basismodul” (base module).	
2.	Select the COM-interface of the computer to which the alpha® WSN base module is connected.	

3. Carry out the following settings

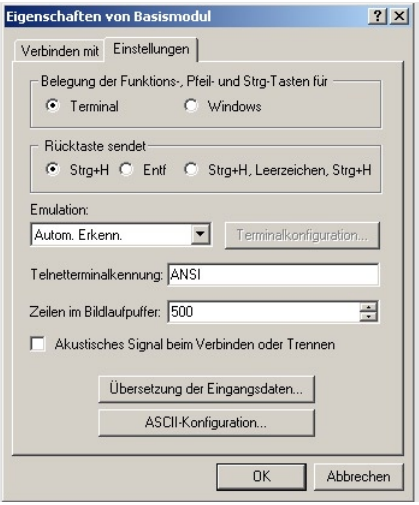
Datenrate (data rate): 115200 Bit/s
Datenbits (data bits): 8 Bit
Parität (parity): Keine (none)
Stoppbits (stop bits): 1 Bit
Flusssteuerung (flow control): Keine (none)

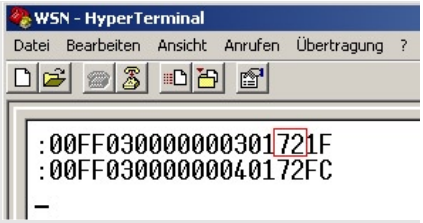


4. Select the menu item “Eigenschaften” (properties) under “Datei” (file).



5. Select the item “Einstellungen“ (Settings) and click on the button “ASCII-Konfiguration“ (ASCII configuration).



6.	In the window ASCII-Konfiguration (ASCII configuration), make the following settings: ASCII-Versand - Gesendete Zeilen enden mit Zeilenvorschub (Carriage Return, ASCII-Code Hex 0D) - Eingegebene Zeichen lokal ... - Zeilenverzögerung: 0 ms - Zeichenverzögerung: 0 ms ASCII-Empfang - Überlange Zeilen im Terminalfenster umbrechen	
7.	Check the connection to the base module by sending <CR> (Carriage Return). As answer of the base module, the answer should now be outputted in form of a message of type 0x72. If this is not the case, please have a look at chapter Troubleshooting.	 Example: Answer to <CR> input

After confirming the options, the terminal programme is ready to send and to receive. When using another terminal programme, the settings have to be carried out like explained in the example of the Hyperterminal programme.

Setting the USB interface

In case your PC is equipped with an USB interface, you can use this connection for the connection with the base module alpha WSN BM 120. For this, you have to have administrator rights or you have to be logged in as system administrator at the system. Install the supplied USB driver as described following.

Automatic USB driver installation

1. Connect the base module alpha WSN BM 120 with the computer by means of an USB cable. A message about newly found hardware is displayed. If this is not the case, please read the chapter "Manual USB driver installation".

Fig.: New hardware found

2. Click on "Weiter" (Next) in the next window.

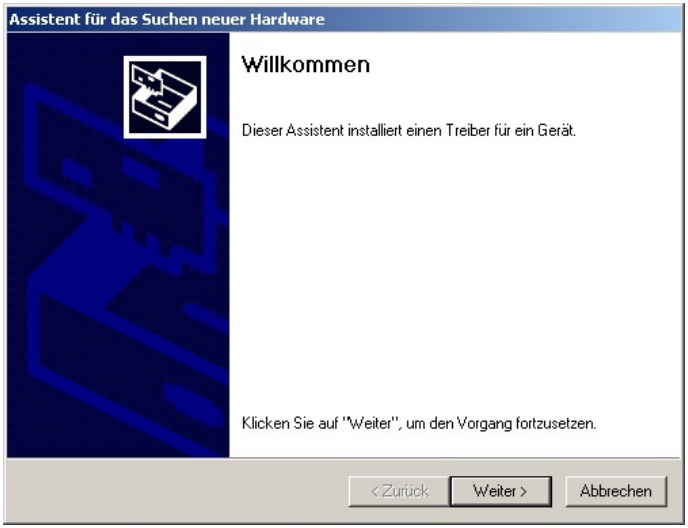

Assistent für das Suchen neuer Hardware
Willkommen
Dieser Assistent installiert einen Treiber für ein Gerät.
Klicken Sie auf "Weiter", um den Vorgang fortzusetzen.
< Zurück
Weiter >
Abbrechen

Fig.: Assistant for searching new hardware

3. Click on "Weiter" (Next) in the next window.

Assistent für das Suchen neuer Hardware
Hardwaretreiber installieren
Ein Gerätetreiber ist ein Programm, das das Ansprechen des Geräts durch das Betriebssystem ermöglicht.
Der Assistent wird die Installation des Geräts fertig stellen:
CP2101 USB to UART Bridge Controller
Gerätetreiber sind Programme zum Steuern der Hardware. Für das neue Gerät sind Treiberdateien erforderlich. Klicken Sie auf "Weiter", um diese Treiberdateien zu suchen und die Installation zu abzuschließen.
Wie möchten Sie vorgehen?
Nach einem passenden Treiber für das Gerät suchen (empfohlen)
Alle bekannten Treiber für das Gerät in einer Liste anzeigen und den entsprechenden Treiber selbst auswählen
< Zurück
Weiter >
Abbrechen

Fig.: Assistant for searching new hardware, install driver

4. Click on "Weiter" (Next) in the next window.

Assistent für das Suchen neuer Hardware
Suche nach Treiberdateien
Geben Sie an, wo nach den Treiberdateien gesucht werden soll.
Nach Treiberdateien für folgende Geräte suchen:
CP2101 USB to UART Bridge Controller
Der Assistent sucht in der Treiberdatenbank und auf den angegebenen Laufwerken nach passenden Treibern.
Klicken Sie auf "Weiter", um die Suche zu starten. Wenn der Suchvorgang auf einer Diskette oder einem CD-ROM-Laufwerk ausgeführt wird, legen Sie zuvor den Datenträger ein.
Andere Quellen für die Suche:
Diskettenlaufwerke
CD-ROM-Laufwerke
Andere Quelle angeben
Microsoft Windows Update
< Zurück
Weiter >
Abbrechen

Fig.: Select driver source

The driver is now searched on the supplied CD and installed.

5. Click on "Weiter" (Next) in the next window.

Assistent für das Suchen neuer Hardware
Treiberdateien - Suchergebnisse
Die Suche nach den Treiberdateien für das Gerät ist beendet.
Für folgendes Gerät wurde ein Treiber gefunden:
CP2101 USB to UART Bridge Controller
Es wurde ein Treiber für das Gerät gefunden. Klicken Sie auf "Weiter", um diesen Treiber zu installieren.
e:\driver\win\cyg_bus.inf
< Zurück
Weiter >
Abbrechen

Fig.: Driver files found

6. Click on "Fertig stellen" (Finish) in the next window.

Assistent für das Suchen neuer Hardware
Fertigstellen des Assistenten
Cygnal USB Composite Device
Die Software für das Gerät wurde installiert.
Klicken Sie auf "Fertig stellen", um den Vorgang abzuschließen.
< Zurück
Fertig stellen
Abbrechen

Fig.: Finish driver installation

With this step, the driver installation is finished.

Manual USB driver installation

In case you see the following symbol down right in the corner of the screen after connecting the base module alpha WSN BM 120 and the dialogue for installing the USB driver does not appear, the USB hardware of the base was not detected automatically.

Fig.: USB hardware that was not detected

You can install the required driver manually with the following steps:

1. Open the device manager with:
   START → Einstellungen → Systemsteuerung → System → Hardware → Geräte-Manager.

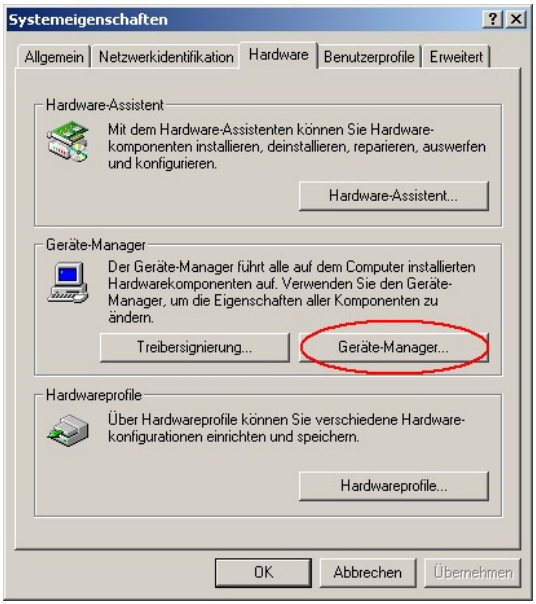


Fig.: Open device manager

2. Open the properties dialogue of the unit "CP2101 USB to UART Bridge Controller" by a double-click. This is marked by a yellow exclamation mark.

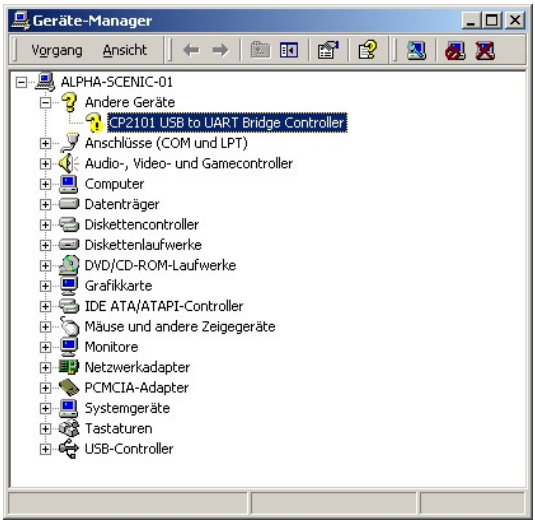


Fig.: Open properties dialogue

3. Click on "Treiber erneut installieren…" (Install driver again...) in the properties dialogue.

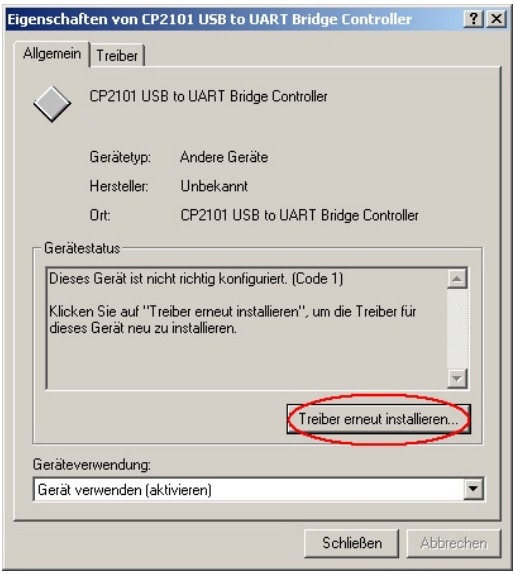

Eigenschaften von CP2101 USB to UART Bridge Controller
Allgemein
Treiber
CP2101 USB to UART Bridge Controller
Gerätetyp: Andere Geräte
Hersteller: Unbekannt
Ort: CP2101 USB to UART Bridge Controller
Gerätestatus
Dieses Gerät ist nicht richtig konfiguriert. (Code 1)
Klicken Sie auf "Treiber erneut installieren", um die Treiber für dieses Gerät neu zu installieren.
Treiber erneut installieren...
Geräteverwendung:
Gerät verwenden (aktivieren)
Schließen
Abbrechen

Fig.: Properties dialogue, install driver again

4. Click on "Weiter" (Next) in the following window.

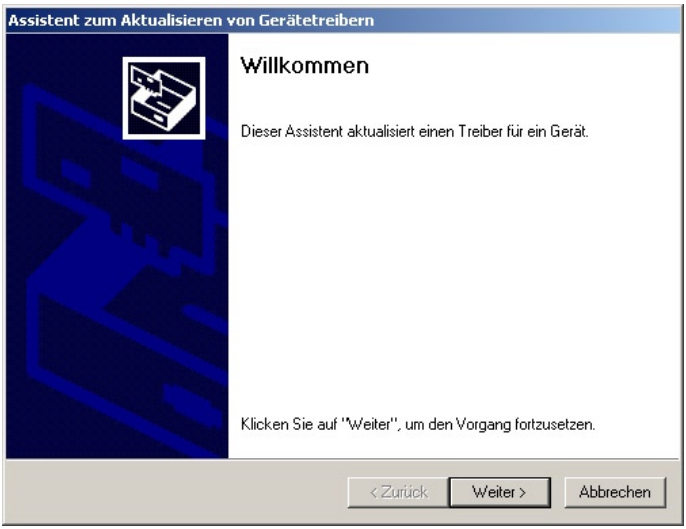

Assistent zum Aktualisieren von Gerätetreibern
Willkommen
Dieser Assistent aktualisiert einen Treiber für ein Gerät.
Klicken Sie auf "Weiter", um den Vorgang fortzusetzen.
< Zurück
Weiter >
Abbrechen

Fig.: Assistant for updating device drivers

5. Click on "Weiter" (Next) in the following window.

Assistent zum Aktualisieren von Gerätetreibern
Hardwaretreiber installieren
Ein Gerätetreiber ist ein Programm, das das Ansprechen des Geräts durch das Betriebssystem ermöglicht.
Der Assistent aktualisiert die Treiber für folgendes Gerät:
CP2101 USB to UART Bridge Controller
Beim Aktualisieren eines Treibers wird der Funktionsumfang des Geräts erweitert oder dessen Leistung optimiert.
Wie möchten Sie vorgehen?
Nach einem passenden Treiber für das Gerät suchen (empfohlen)
Alle bekannten Treiber für das Gerät in einer Liste anzeigen und den entsprechenden Treiber selbst auswählen
< Zurück
Weiter >
Abbrechen

Fig.: Assistant for searching new drivers

6. Insert the supplied CD into the CD-ROM drive.
   Select "CD-ROM-Laufwerke" (CD-ROM drives) as source for the driver search.
   Click on "Weiter" (Next).

Assistent zum Aktualisieren von Gerätetreibern
Suche nach Treiberdateien
Geben Sie an, wo nach den Treiberdateien gesucht werden soll.
Nach Treiberdateien für folgende Geräte suchen:
CP2101 USB to UART Bridge Controller
Der Assistent sucht in der Treiberdatenbank und auf den angegebenen Laufwerken nach passenden Treibern.
Klicken Sie auf "Weiter", um die Suche zu starten. Wenn der Suchvorgang auf einer Diskette oder einem CD-ROM-Laufwerk ausgeführt wird, legen Sie zuvor den Datenträger ein.
Andere Quellen für die Suche:
Diskettenlaufwerke
CD-ROM-Laufwerke
Andere Quelle angeben
Microsoft Windows Update
< Zurück
Weiter >
Abbrechen

Fig.: Select the source for the driver

7. Finish the installation with "Fertigstellen" (Finish).

Assistent zum Aktualisieren von Gerätetreibern
Fertigstellen des Assistenten
Cygnal USB Composite Device
Die Software für das Gerät wurde installiert.
Klicken Sie auf "Fertig stellen", um den Vorgang abzuschließen.
< Zurück
Fertig stellen
Abbrechen

Fig.: Finish the manual driver installation

If you can still see a yellow exclamation mark in the device manager, please carry out the instructions of this chapter a second time.

Checking the USB driver settings

To check the correct installation of the USB driver, please proceed as follows and open:

1. Start → Einstellungen → Systemsteuerung → System → Hardware → Gerätemanager
2. Click on the "+" in front of "Anschlüsse (COM und LPT)" (Connections (COM and LPT))

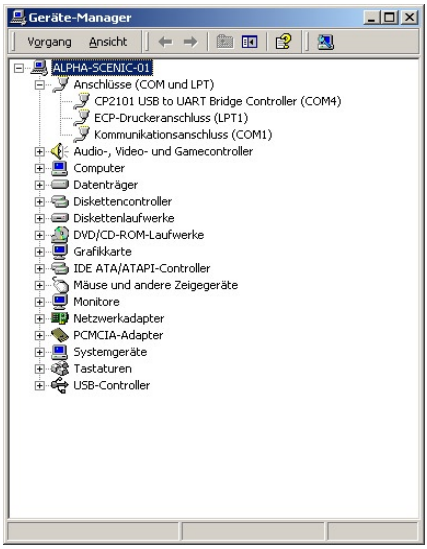


Fig.: Device manager

3. Twice click on the entry: "CP2101 USB to UART Bridge Controller (COMx)".

A new COM-Port (COMx) should be entered here now. The "x" stands for the respective COM-Port that has to be set, e. g. COM2.

4. Then select the button "Anschlusseinstellungen".
5. Check the following settings:

bits per second:	115200
data bits:	8
parity:	none
stop bits:	1
flow control:	none

6. Close the window and terminate the device manager.

If all installations are correct, a new COM-Port for the communication with the base module is available now.

Link test USB-Port

Open a terminal programme (e. g. Hyperterminal from Microsoft Windows) and install it according to chapter "Settings at the RS232 interface" or "Settings at the terminal programme".
Open the COM-Port you have just installed and send a <CR> (Carriage Return) to the base module. If everything is set correctly, you should see a message of type 0x72 of the base module in the terminal window. Also see chapter "Protocol description". If this is not the case, it will not be possible to communicate correctly with the base module. Please have a look at the chapter "Troubleshooting" for this topic.

Setting the LAN interface

In case your PC is equipped with a LAN interface, you can use this connection for the connection with the base module alpha WSN BM 110. For this, you have to have administrator rights or you have to login to the system as system administrator. Install the supplied LAN driver as described following.
When connecting a base module alpha WSN BM110 over a LAN cable directly to a PC (no PC network), a crossed Twisted Pair LAN cable has to be used.
A HTML page is available for all manual configurations. In order to be able to make changes, start a browser (e. g. Internet Explorer) and enter the IP address of the LAN module into the address line. In case you do not know the IP address, have a look at the chapter "Searching for modules by means of Discovery-Tool".

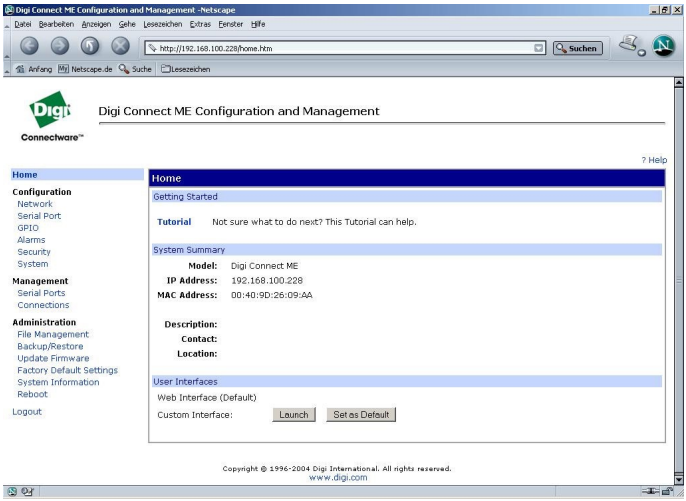


Fig.: Configuration page LAN modul

Automatic setting of the IP address

The LAN module of the base module alpha WSN BM 110 is set to DHCP by default. So the IP address will automatically be assigned in case a DHCP server exists.

Manual setting of the IP address

In case no DHCP server is available, the IP address can also be configured manually. Proceed as follows:
Open a browser (e. g. Internet Explorer) and enter the current IP address of the LAN module into the address line. As a result, the configuration page will be opened.

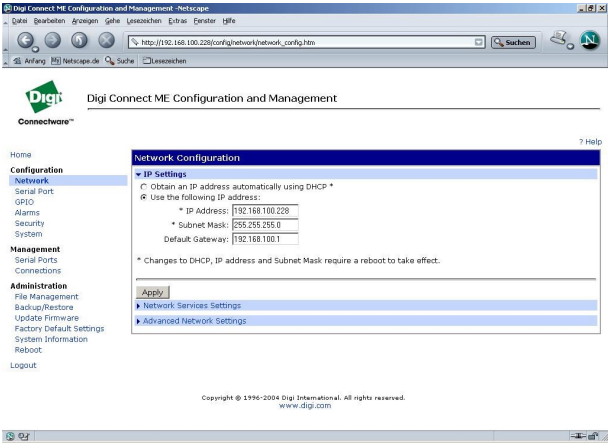


Fig.: Configuration page network settings

Setting Serial-Port-Profile

So that the base module of the wireless measurement system works best possible, it is necessary to configurate the Serial-Port-Profile of the WLAN module correctly. For this purpose, select the point "Serial Port" on the configuration page under "Configuration" and set the Radio Button to "RealPort".

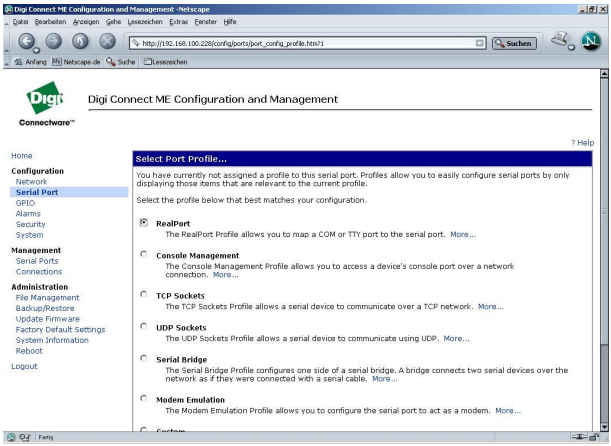

Digi Connect ME Configuration and Management -Netscape
Digi Connect ME Configuration and Management
Home
Configuration
Network
Serial Port
GPIO
Alarms
Security
System
Management
Serial Ports
Connections
Administration
File Management
Backup/Restore
Update Firmware
Factory Default Settings
System Information
Reboot
Logout
? Help
Select Port Profile...
You have currently not assigned a profile to this serial port. Profiles allow you to easily configure serial ports by only displaying those items that are relevant to the current profile.
Select the profile below that best matches your configuration.
RealPort
The RealPort Profile allows you to map a COM or TTY port to the serial port. More...
Console Management
The Console Management Profile allows you to access a device's console port over a network connection. More...
TCP Sockets
The TCP Sockets Profile allows a serial device to communicate over a TCP network. More...
UDP Sockets
The UDP Sockets Profile allows a serial device to communicate using UDP. More...
Serial Bridge
The Serial Bridge Profile configures one side of a serial bridge. A bridge connects two serial devices over the network as if they were connected with a serial cable. More...
Modem Emulation
The Modem Emulation Profile allows you to configure the serial port to act as a modem. More...

Fig.: Configuration page Serial-Port-Profile

Further settings of the LAN module

The LAN module is by default provided with a configuration that is optimal for many applications. Should it however become necessary to optimize the configuration, a multitude of settings can be made manually. A HTML page is available for this purpose. Open a browser (e. g. Internet Explorer from Microsoft) and call the configuration page (by entering the IP address into the address line).

Setting the WLAN interface

The base module alpha WSN BM 130 provides the opportunity to make the received data available over a WLAN. The PC, on which the data shall be displayed, has to be equipped with WLAN or with a LAN port for the connection of a WLAN access point as well as with an Internet browser.
A HTML page is available for all manual configurations. In order to be able to make changes, start a browser (e. g. Internet Explorer) and enter the IP address of the LAN module into the address line. In case you do not know the IP address, have a look at the chapter "Searching for modules by means of Discovery-Tool".

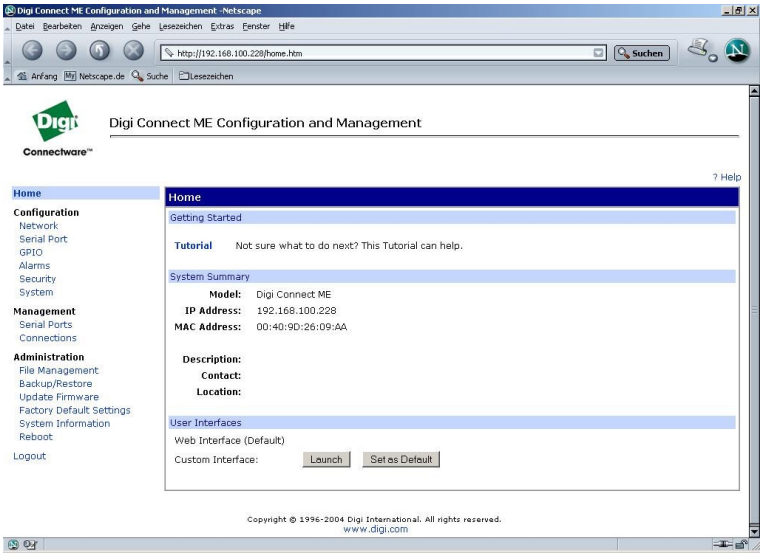


Fig.: Configuration page WLAN module

Automatic setting of the IP address

The WLAN module of the base module alpha WSN BM 130 is set to DHCP by default. So the IP address will automatically be assigned in case a DHCP server exists.

Manual setting of the IP address

In case no DHCP server is available, the IP address can also be configured manually. Proceed as follows:
Open a browser (e. g. Internet Explorer) and enter the current IP address of the WLAN module into the address line. As a result, the configuration page will be opened.

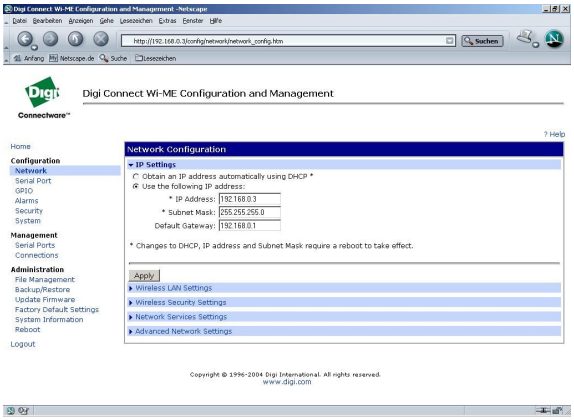
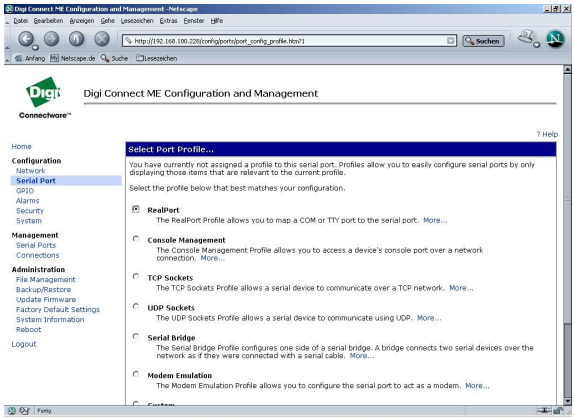

Digi Connect Wi-ME Configuration and Management
Network Configuration
IP Settings
Obtain an IP address automatically using DHCP *
Use the following IP address:
* IP Address: 192.168.0.3
* Subnet Mask: 255.255.255.0
Default Gateway: 192.168.0.1
* Changes to DHCP, IP address and Subnet Mask require a reboot to take effect.
Apply
Wireless LAN Settings
Wireless Security Settings
Network Services Settings
Advanced Network Settings

Fig.: Configuration page WLAN module

Setting Serial-Port-Profile

So that the base module of the wireless measurement system works best possible, it is necessary to configure the Serial-Port-Profile of the WLAN module correctly. For this purpose, select the point "Serial Port" on the configuration page under "Configuration" and set the Radio Button to "RealPort".


Digi Connect ME Configuration and Management
Select Port Profile...
You have currently not assigned a profile to this serial port. Profiles allow you to easily configure serial ports by only displaying those items that are relevant to the current profile.
Select the profile below that best matches your configuration.
RealPort
The RealPort Profile allows you to map a COM or TTY port to the serial port. More...
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The Console Management Profile allows you to access a device's console port over a network connection. More...
TCP Sockets
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The UDP Sockets Profile allows a serial device to communicate using UDP. More...
Serial Bridge
The Serial Bridge Profile configures one side of a serial bridge. A bridge connects two serial devices over the network as if they were connected with a serial cable. More...
Modem Emulation
The Modem Emulation Profile allows you to configure the serial port to act as a modem. More...

Fig.: Configuration page Serial-Port-Profile

Setting the encoding

If you want to use an encoded radio transmission, the encoding will have to be activated. Proceed like at the manual setting of the IP address. But then select "Wireless Security Settings" on the page "Network Configuration". Now you can carry out the desired security settings.

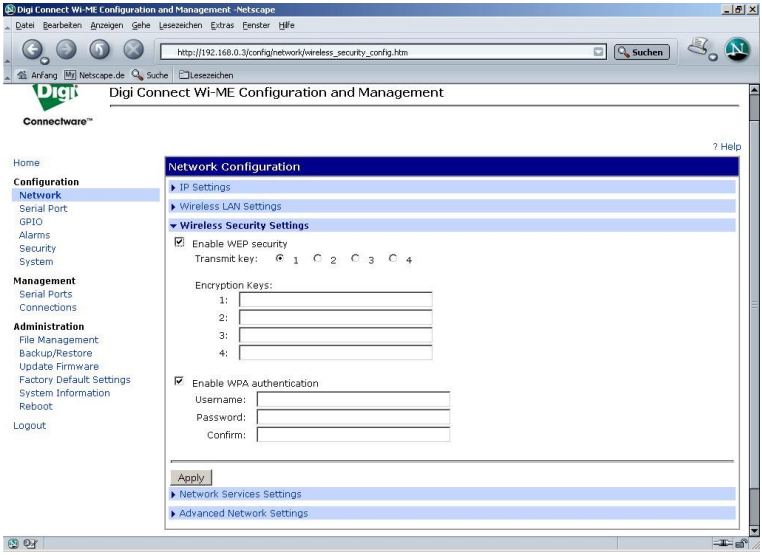


Fig.: Configuration page WLAN security settings

Further settings of the WLAN module

The WLAN module is by default provided with a configuration that is optimal for many applications. Should it however become necessary to optimize the configuration, a multitude of settings can be made manually. A HTML page is available for this purpose. Open a browser (e. g. Internet Explorer from Microsoft) and call the configuration page (by entering the IP address into the address line).

Searching for modules by means of Discovery-Tool

In case you do not know the address of a LAN module and/ or you do not have a DHCP server, modules that are not obtainable can be found by means of the Digi-Device-Discovery-Tool and the IP address can be configured.
The Device-Discovery-Tool can be downloaded on the following website:
http://www.digi.com/support/productdetl.jsp?pid=2466&osvid=56&s=53#utilities.
After starting the programme, all obtainable modules are automatically searched and displayed. If you click on the desired module and afterwards on the link "Configure network settings", you will get to the setting page for the network parameters.

The module can be configured to DHCP or a fixed IP address there.

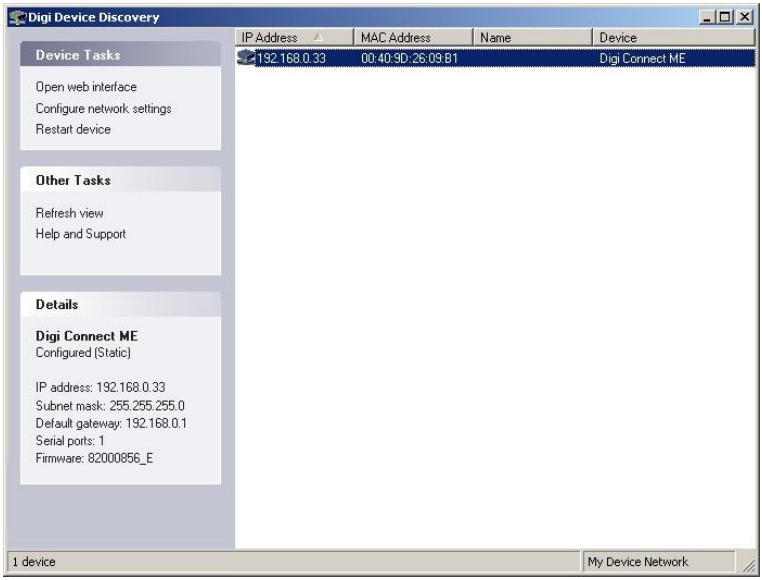


Fig.: Main window of the Discovery-Tools

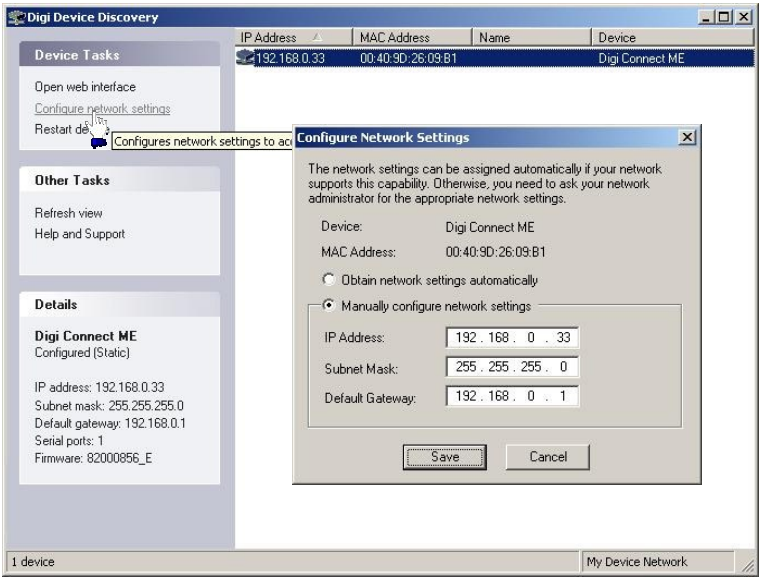


Fig.: Network settings

Control software and software interface

Control software alpha data view

For the operation of the wireless measurement system, an easily operated Windows software is available. By means of this software, the measured values of the sensors existing in the network can be represented and stored. Measuring interval and range limits can also be set.

Installation of the control software alpha data view

For the installation, insert the supplied CD into the CD-ROM drive of your PC and follow the instructions on the screen. In case the autostart function should be deactivated, please start the file SETUP.EXE.

Short description of the control software alpha data view

Before starting the programme, please inform yourself about the connections (COM and LPT) that you want to use for the communication with the connected base station in the device manager of your operating system (see chapter "Configuration of the interfaces").

1. Start programme alpha data view
2. Open the interface to the base station (menu item settings)
3. Leave the display window base station (button: close window)
   The surface of the programme is divided into three windows that are adjustable in size. These windows are referred to as follows: table window (left), main window (top right) and event window (down right). In the main window of the programme, a two-dimensional matrix display of the sensors appears.
4. Putting the sensor modules into operation
   The sensor modules log on to the base station an. These are shown in the table window as address number.
5. Assign the address numbers to the matrix

5.1 Move the mouse pointer to a sensor of the matrix display
5.2 Press right mouse button
5.3 Select menu item "Adresse eingeben" (Enter address)
5.4 Enter address and press button "Übernehmen" (Accept)

6. Repeat the points 4 and 5 for all sensors of the wireless network
7. Chart the sensor data (diagram display)

7.1 Move the mouse pointer to a sensor of the matrix display
7.2 Press left mouse button

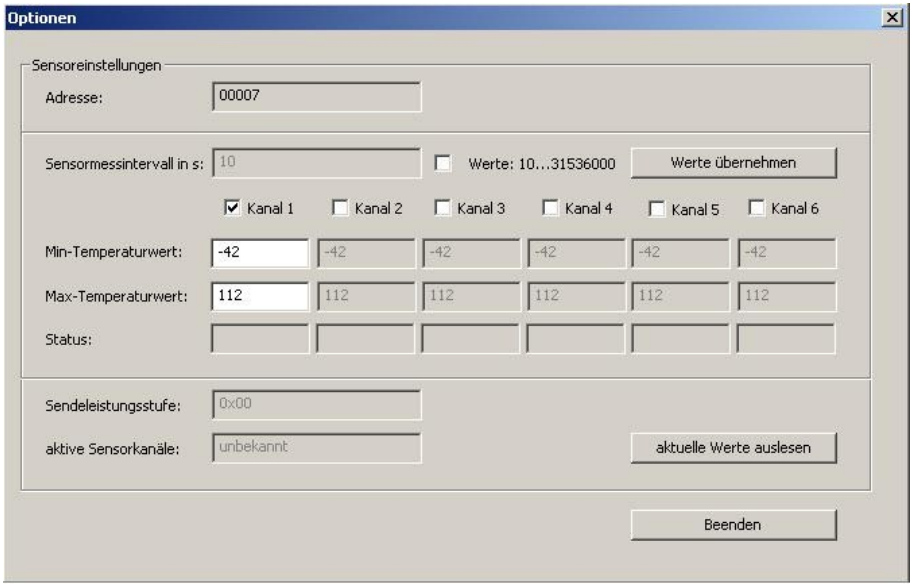
8. Define the colour of the line

8.1 Actuate keys measuring point 1 ... 6
8.2 Set the colour of the line for the selected measuring point

Setting the sensor parameters

You can set the sensor measuring interval and the range limits (min-temperature value, max-temperature value) at all wireless sensor modules that are registered at the base station and entered in the matrix.

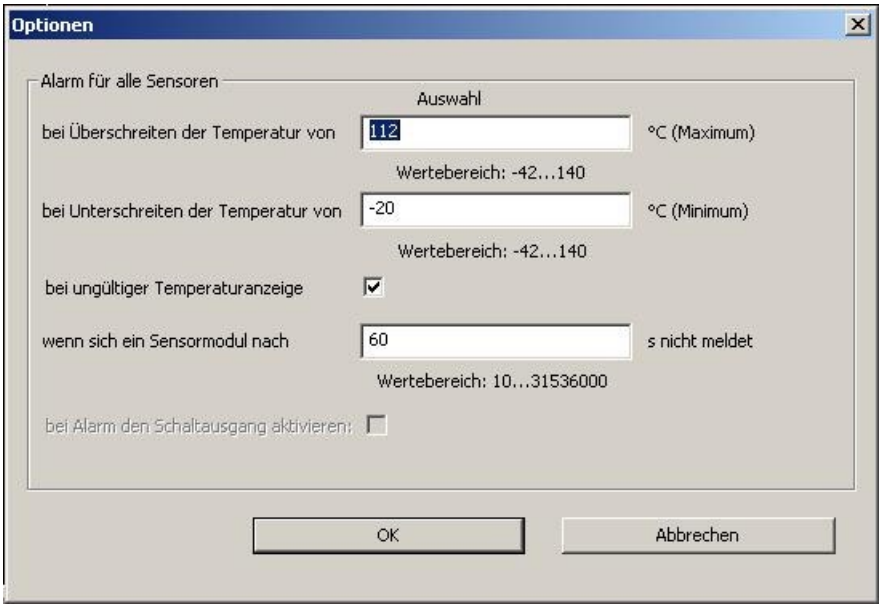
1. Select diagram display of a wireless sensor module
2. Actuate button "Sensoreinstellungen" (Sensor settings)
3. Enter parameter values



4. Actuate button "Werte übernehmen" (Accept values)

Selecting alarm criteria for all sensors

1. Select alarm settings (menu item settings)
2. Enter parameter values



3. Confirm OK button

Software interface

For users who want to develop an own application for the wireless measurement system, a software interface for the operation of the system is available. By means of this interface, you can access the same functionality like that one that is available to the control software. Following, the messages between PC and base module are explained.

Protocol description

Basically, it is distinguished between two message types.

1. Messages from the base module to the PC
2. Messages from the PC to the base module

Following, both types are explained in detail.

Messages from the base module to the PC

Byte	Description	Range	Explanation
0	Headerbyte „:“	Header	0x3A
1	Sender address LOW Byte (hex ascii)	Header	
2	Sender address HIGH Byte (hex ascii)	Header	
3	Timestamp of the message LOW Byte (hex ascii)	Header	Time in seconds
4	Timestamp of the message (hex ascii)	Header	Since 1st January 1970, 0:00 o’clock GMT
5	Timestamp of the message (hex ascii)	Header	
6	Timestamp of the message HIGH Byte (hex ascii)	Header	
7	Sequence number of the message (hex ascii)	Header	Continuous sequence number
8	Number single messages	Data	
9	Message type 1 (hex ascii)	Data	see command overview
10	Data byte 1 of message type 1 (hex ascii)	Data	
11	Data byte 2 of message type 1 (hex ascii)	Data	
…		Data	
m	Message type 2 (hex ascii)	Data	
m+1	Data byte 1 of message type 2 (hex ascii)	Data	
m+2	Data byte 2 of message type 2 (hex ascii)	Data	
…		Data	
N-2	CRC (hex ascii)	CRC	Check sum over Byte 0..N-3
N-1	Final character Carriage Return (hex)	CRC	0x0D

Table: Message base module → PC

The data area is max. 34 byte at messages over radio interface and max. 47 byte at messages of the base module only over UART.

Messages from the PC to the base module

Byte	Description	Range	Explanation
0	Headerbyte „:“	Header	0x3A
1	Destination address LOW Byte (hex ascii)	Header	
2	Destination address HIGH Byte (hex ascii)	Header	
3	Number single messages	Data	
4	Message type 1 (hex ascii)	Data	See command overview
5	Data byte 1 of message type 1 (hex ascii)	Data	
6	Data byte 2 of message type 1 (hex ascii)	Data	
…		Data	
m	Message type 2 (hex ascii)	Data	
m+1	Data byte 1 of message type 2 (hex ascii)	Data	
m+2	Data byte 2 of message type 2 (hex ascii)	Data	
…		Data	
N-2	CRC (hex ascii)	CRC	Check sum over Byte 0..N-3
N-1	Final character Carriage Return (hex)	CRC	0x0D

Table: Message PC → base module

The data area is max. 31 byte.

Description	Name	Message-typ hex	Number data bytes	Data byte 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Request sensor event(s) (answer in SENSOR_MSG_RES)	SENSOR_MSG_REQ	0x81	1	Sensor type																		
Sensor event(s), answer to request (→ SENSOR_MSG_REQ)	SENSOR_MSG_RES	0x01	depending on the sensor type																			
			3	Sensor type	R																	
			2	Sensor type	State																	
Sensor event(s) released by the module itself (e. g. by interval timer or ext. interrupt)	SENSOR_MSG_IND	0x02	3	Sensor type	R																	
Polling software version (answer in SERVICE_MSG_VERSION_RES)	SERVICE_MSG_VERSION_REQ	0x8A	0	no data																		
Current software version (answer to SERVICE_MSG_VERSION_REQ)	SERVICE_MSG_VERSION_RES	0x0A	19	String: Software version as zero-scheduled string, e. g. "PT100x V0.01#0001R"; data byte 19: EOS → string final character => "0"																		EOS
Reloading of the module configuration (answer in SERVICE_MSG_RESTART_SENSOR_RES)	SERVICE_MSG_RESTART_SENSOR_REQ	0x8C	0	no data																		
Answer to SERVICE_MSG_RESTART_SENSOR_REQ	SERVICE_MSG_RESTART_SENSOR_RES	0x0C	1	State																		
Set system time (answer in SERVICE_MSG_SET_TIME_RES)	SERVICE_MSG_SET_TIME_REQ	0x91	5	Sync	Time stamp																	
Answer to SERVICE_MSG_SET_TIME_REQ)	SERVICE_MSG_SET_TIME_RES	0x11	1	State																		
Poll system time (answer in SERVICE_MSG_GET_TIME_RES)	SERVICE_MSG_GET_TIME_REQ	0x92	0	no data																		
Answer to SERVICE_MSG_GET_TIME_REQ	SERVICE_MSG_GET_TIME_RES	0x12	5	Sync	Time stamp																	
Poll system voltage VCC (answer in SERVICE_MSG_VCC_RES)	SERVICE_MSG_VCC_REQ	0x93	0	no data																		
Answer to SERVICE_MSG_VCC_REQ	SERVICE_MSG_VCC_RES	0x13	2	Voltage																		
Polling module information (answer in SERVICE_MSG_INFO_RES)	SERVICE_MSG_INFO_REQ	0x98	0	no data																		
Answer to SERVICE_MSG_INFO_REQ	SERVICE_MSGINFO_RES	0x18	18	netID	Sensor Polling					RES				RES		state	ModType	RES	RES	RES	RES	
Polling module serial number (answer in SERVICE_MSG_SERIAL_RES)	SERVICE_MSG_SERIAL_REQ	0x99	0	no data																		
Answer to SERVICE_MSG_SERIAL_REQ	SERVICE_MSG_SERIAL_RES	0x19	17	String module serial number as zero-scheduled string, e. g.: "28010188S1000001" data byte17: EOS → string final character => "0"																EOS		
Login of the PC at the base module, messages can now be outputted directly per UART (answer in SERVICE_MSG_PC_LOGIN_RES)	SERVICE_MSG_PC_LOGIN_REQ	0x9D	0	no data																		
Answer to SERVICE_MSG_PC_LOGIN_REQ	SERVICE_MSG_PC_LOGIN_RES	0x1D	3	State	Count																	
Logout of the PC from the base module, messages now have to be buffered in the DataFlash (answer in SERVICE_MSG_PC_LOGOUT_RES)	SERVICE_MSG_PC_LOGOUT_RES	0x9E	0	no data																		
Answer to SERVICE_MSG_PC_LOGOUT_REQ	SERVICE_MSG_PC_LOGOUT_RES	0x1E	1	State																		

Table: Overview of commands

Description	Name	Message type hex	Number data bytes	Data byte 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Rule polling of the PC to the base module (answer in SERVICE_MSG_PC_RES) Failure of this message for 5 min → intermediate storage of the messages in the DataFlash)	SERVICE_MSG_PC_REQ	0x9F	0	no data																		
Answer to SERVICE_MSG_PC_REQ detection activity base module	SERVICE_MSG_PC_RES	0x1F	1	State																		
			3	State	Count																	
Reading of the buffered messages (answer in SERVICE_MSG_DATA_FLASH_RES) All messages stored in the DataFlash are directly outputted one after the other (SEE FRAME PARTITIONING) --> Timeout approx. 1 s	SERVICE_MSG_DATA_FLASH_REQ	0xA0	0	no data																		
Status reading of the buffered messages (answer to SERVICE_MSG_DATA_FLASH_REQ after the read messages or error messages!	SERVICE_MSG_DATA_FLASH_RES	0x20	1	State																		
Deleting of the buffered messages (answer in SERVICE_MSG_DEL_DATA_FLASH_RES)	SERVICE_MSG_DEL_DATA_FLASH_REQ	0xA1	0	no data																		
Answer to SERVICE_MSG_DEL_DATA_FLASH_REQ	SERVICE_MSG_DEL_DATA_FLASH_RES	0x21	1	State																		
Activation/deactivation alarm output from the base module (answer in SERVICE_MSG_ALERT_RES)	SERVICE_MSG_ALERT_REQ	0xA2	1	State																		
Answer to SERVICE_MSG_ALERT_REQ	SERVICE_MSG_ALERT_RES	0x22	1	State																		
Module login incl. module information, independent message after power on (PC has to send a SERVICE_MSG_PC_LOGIN_REQ after approx. 4 s)	SERVICE_MSG_MODULE_LOGIN_IND	0x30	20	like SERVICE_MSG_INFO_RES																		
Module login incl. serial number, independent after power on	SERVICE_MSG_MODULE_SERIAL_IND	0x31	17	like SERVICE_MSG_SERIAL_RES																		
Module login incl. Software version, independent message after power on	SERVICE_MSG_MODULE_VERSION_IND	0x32	19	like SERVICE_MSG_VERSION_RES																		
Alarm message system voltage below critical level	SERVICE_MSG_VCC_ALERT_IND	0x33	2	Voltage																		
Module login incl. current system voltage	SERVICE_MSG_VCC_LOGIN_IND	0x34	2	Voltage																		
Message power supply unit detected (only for repeater module)	INFO_PWR_DETECT	0x5E	0	no data																		
RSSI value of the current message	SERVICE_MSG_RSSI_IND	0x35	2	RSSI																		
Message power supply unit was removed (only for repeater module)	INFO_NO_POWER_DETECT	0x5F	0	no data																		
Message USB detected (only for USB base)	INFO_USB_DETECT	0x60	0	no data																		
Message USB was removed (only for USB base)	INFO_NO_USB_DETECT	0x61	0	no data																		
Message Timeout → Failure of the PC rule polling for 5 min	ERROR_PC_CHECK_TIMEOUT	0x68	0	no data																		
Message Power over Ethernet detected (only for LAN base)	INFO_POE_DETECT	0x69	0	no data																		
Message Power over Ethernet was removed (only for LAN base)	INFO_NO_POE_DETECT	0x6A	0	no data																		
Message interval measurement of the sensors not started (e. g. because of not active sensor groups)	ERROR_CALL_SENSOR	0x6B	0	no data																		
Message UART packet with faulty length data field packet is rejected	ERROR_UART_DATA_LEN	0x70	0	no data																		
Message UART with faulty CRC packet is rejected	ERROR_UART_CRC	0x71	0	no data																		
Message UART packet with faulty Header Byte ":" packet is rejected	ERROR_UART_HEADER	0x72	0	no data																		

Description data bytes

Sensor type Bit 7	
0	valid
1	error
Sensor type Bit 6..0	
0x16	channel 1 PT1000
0x17	channel 2 PT1000
0x18	channel 3 PT1000
0x19	channel 4 PT1000
0x1A	channel 5 PT1000
0x1B	channel 6 PT1000
R	
R	Resistance value * 10 for PT1000 channels (0→invalid value, e. g. the Min / Max values
State (SENSOR_MSG_RES)	
0x07	Type of sensor unknown
0x08	Current module is no sensor module
0x01	Internal error
Sync	
0x01	Time transmitted is synchronous
Timestamp	Timestamp → time in s since 1st January. 1970, 0:00 o'clock
State general	
0x00	Command executed successfully
0x01	Error during executing the command
Voltage	Voltage in mV
netID	Module network ID
SensorPolling	Sensor sampling interval in s (only sensor module! – otherwise 0)

State (SERVICE_MSG_INFO_RES)	
Bit0 = 1	Read module configuration OK
Bit1 = 1	Read module configuration OK, only at sensor modules
Bit3 = 1	External reference source available
Bit4 = 1	USB detect (only USB Base); PoE detect (only LAN Base); power supply unit detect (only Repeater)
Bit5 = 1	HF Transciever standby (higher power consumption, faster switching times)
ModType	
Bit 7	Module group Base
Bit 6	Module group Repeater
Bit 5	Module group Sensor

Bit 3..0	Module type (0=>USB Base; 3=>PT1000 6-channel; 4=>Repeater; 5=>LAN Base; 6=>WLAN Base)
RES	Reserved
State (SERVICE_MSG_PC_LOGIN_RES)	
0x00	Base module ready
0x01	Error
Count	Number of buffered messages in the flash
State (SERVICE_MSG_PC_LOGOUT_RES)	
0x00	Base module ready, buffer active
0x01	Error, messages can possibly not be buffered
State (SERVICE_MSG_PC_RES)	
0x00	Base module ready
0x01	Base module has buffered messages
State (SERVICE_MSG_DATA_FLASH_RES)	
0x00	Reading finished
0x01	No reading possible or reading cancelled with error
0x03	Data set with CRC Error, los of file
0x04	Data set with length error, Message inconsistent, loss of data
State (SERVICE_MSG_DEL_DATA_FLASH_RES)	
0x00	Deletion finished without error
0x01	Error, Deletion not / uncompleted possible
State (SERVICE_MSG_ALERT_REQ)	
0x05	Set alarm output active
0x06	Set alarm output inactive
RSSI (SERVICE_MSG_RSSI_IND)	
RSSI	Field strength value * 10 dBm (signed)

Table: Description data bytes

Setting the measuring interval

Two specific commands are necessary for the setting of the measuring interval. The first command (message type REQ:0x88 RES:0x08) sets the measuring interval. The second command (message type REQ:0x8C RES:0x0C) loads the module configuration anew. These commands have to be sent to the base module. The messages as well as the appropriate answers are given in the following table.

Description	Number Messages	Message type hex	Data byte1	Data byte2	Data byte3	Data byte4	Data byte5	Data byte6	Data byte7
Setting measuring interval	0x02	0x88	0x84	0x04	DWord: measuring interval				0x8C
					Measuring interval in seconds, LSByte first				
Answer to setting measuring interval	0x02	0x08	0x84	0x04	0x00	0x0C	0x00	Setting was accepted	
	0x02	0x08	0x84	0x04	!= 0	0x0C	!= 0	Error	

Table: Setting measuring intervals

Setting the minimum and maximum capacities

The setting of the range limits is done analogue to the setting of the measuring interval. The following table shows the necessary messages and answers for every measuring sensor.

Description	Number of messages	Message type hex	Data byte1	Data byte2	Data byte3	Data byte4	Data byte5	Data byte6	Data byte7
Setting min value channel 1 PT1000	0x02	0x88	0x9E	0x02	Word: Min		0x8C		
					Min: resistance in Ohm * 10, LSByte first				
Answer to setting min value channel 1 PT1000	0x02	0x08	0x9E	0x02	0x00	0x0C	0x00	Setting was accepted	
	0x02	0x08	0x9E	0x02	!= 0	0x0C	!= 0	Error	
Setting max value channel 1 PT1000	0x02	0x88	0xA0	0x02	Word: Max		0x8C		
					Max: resistance in Ohm * 10, LSByte first				
Answer to setting max value channel 1 PT1000	0x02	0x08	0xA0	0x02	0x00	0x0C	0x00	Setting was accepted	
	0x02	0x08	0xA0	0x02	!= 0	0x0C	!= 0	Error	
Setting min value channel 2 PT1000	0x02	0x88	0xB0	0x02	Word: Min		0x8C		
					Min: resistance in Ohm * 10, LSByte first				
Answer to setting min value channel 2 PT1000	0x02	0x08	0xB0	0x02	0x00	0x0C	0x00	Setting was accepted	
	0x02	0x08	0xB0	0x02	!= 0	0x0C	!= 0	Error	
Setting max value channel 2 PT1000	0x02	0x88	0xB2	0x02	Word: Max		0x8C		
					Max: resistance in Ohm * 10, LSByte first				

Description	Number of messages	Message type hex	Data byte1	Data byte2	Data byte3	Data byte4	Data byte5	Data byte6	Data byte7
Answer to setting max value channel 2 PT1000	0x02	0x08	0xB2	0x02	0x00	0x0C	0x00	Setting was accepted	
	0x02	0x08	0xB2	0x02	!= 0	0x0C	!= 0	Error	
Setting min value channel 3 PT1000	0x02	0x88	0xC2	0x02	Word: Min		0x8C		
					Min: resistance value in Ohm * 10, LSByte first				
Answer to setting min value channel 3 PT1000	0x02	0x08	0xC2	0x02	0x00	0x0C	0x00	Setting was accepted	
	0x02	0x08	0xC2	0x02	!= 0	0x0C	!= 0	Error	
Setting max value channel 3 PT1000	0x02	0x88	0xC4	0x02	Word: Max		0x8C		
					Max: resistance value in Ohm * 10, LSByte first				
Answer to setting max value channel 3 PT1000	0x02	0x08	0xC4	0x02	0x00	0x0C	0x00	Setting was accepted	
	0x02	0x08	0xC4	0x02	!= 0	0x0C	!= 0	Error	
Setting min value channel 4 PT1000	0x02	0x88	0xD4	0x02	Word: Min		0x8C		
					Min: resistance value in Ohm * 10, LSByte first				
Answer to setting min value channel 4 PT1000	0x02	0x08	0xD4	0x02	0x00	0x0C	0x00	Setting was accepted	
	0x02	0x08	0xD4	0x02	!= 0	0x0C	!= 0	Error	
Setting max value channel 4 PT1000	0x02	0x88	0xD6	0x02	Word: Max		0x8C		
					Max: resistance value in Ohm * 10, LSByte first				

Table: Setting of range limits

Description	Number of messages	Message type hex	Data byte1	Data byte2	Data byte3	Data byte4	Data yte5	Data byte6	Data byte7
Answer to setting max value channel 4 PT1000	0x02	0x08	0xD6	0x02	0x00	0x0C	0x00	Setting was accepted	
	0x02	0x08	0xD6	0x02	!= 0	0x0C	!= 0	Error	
Setting min value channel 5 PT1000	0x02	0x88	0xE6	0x02	Word: Min		0x8C		
					Min: resistance value in Ohm * 10, LSByte first				
Answer to setting min value channel 5 PT1000	0x02	0x08	0xE6	0x02	0x00	0x0C	0x00	Setting was accepted	
	0x02	0x08	0xE6	0x02	!= 0	0x0C	!= 0	Error	
Setting max value channel 5 PT1000	0x02	0x88	0xE8	0x02	Word: Max		0x8C		
					Max: resistance value in Ohm * 10, LSByte first				
Answer to setting max value channel 5 PT1000	0x02	0x08	0xE8	0x02	0x00	0x0C	0x00	Setting was accepted	
	0x02	0x08	0xE8	0x02	!= 0	0x0C	!= 0	Error	
Setting min value channel 6 PT1000	0x02	0x88	0xF8	0x02	Word: Min		0x8C		
					Min: resistance value in Ohm * 10, LSByte first				
Answer to setting min value channel 6 PT1000	0x02	0x08	0xF8	0x02	0x00	0x0C	0x00	Setting was accepted	
	0x02	0x08	0xF8	0x02	!= 0	0x0C	!= 0	Error	
Setting max value channel 6 PT1000	0x02	0x88	0xFA	0x02	Word: Max		0x8C		
					Max: resistance value in Ohm * 10, LSByte first				
Answer to setting max value channel 6 PT1000	0x02	0x08	0xFA	0x02	0x00	0x0C	0x00	Setting was accepted	
	0x02	0x08	0xFA	0x02	!= 0	0x0C	!= 0	Error	

Login procedure PC at the base module

The base module has the possibility to buffer received data sets in case of temporary switching off of the PC. A registration of the PC at the base module is necessary to control this mechanism.
After activating the base module, it sends the message "SERVICE_MSG_MODULE_LOGIN_IND". This has to be acknowledged in every case. For this purpose, the PC sends the message „SERVICE_MSG_PC_LOGIN_REQ“.
In case the base station has already been activated when the application software is started, the message "SERVICE_MSG_PC_LOGIN_REQ" will also have to be sent from the PC. The base module acknowledges the message and gives an information whether stored data exists. These data can now be recalled and deleted.
After successful login, the base module now outputs all data sets over the interface to the PC.
The base module waits for a message from the PC for the connection control every 5 minutes during operation. This message should occur at the latest after 5 minutes, but at the earliest a few seconds before.
In case this message is missing, the base module automatically starts to store the received data sets. In case the connection is established again, the base module then gives the PC an information that the data was stored.
In case the application software should be closed shortly, the PC releases a logout message. The base module acknowledges this message and stores the received data sets from then on until the new login of the PC.
Please bear in mind that only a limited number of data sets can be buffered!

Login procedure

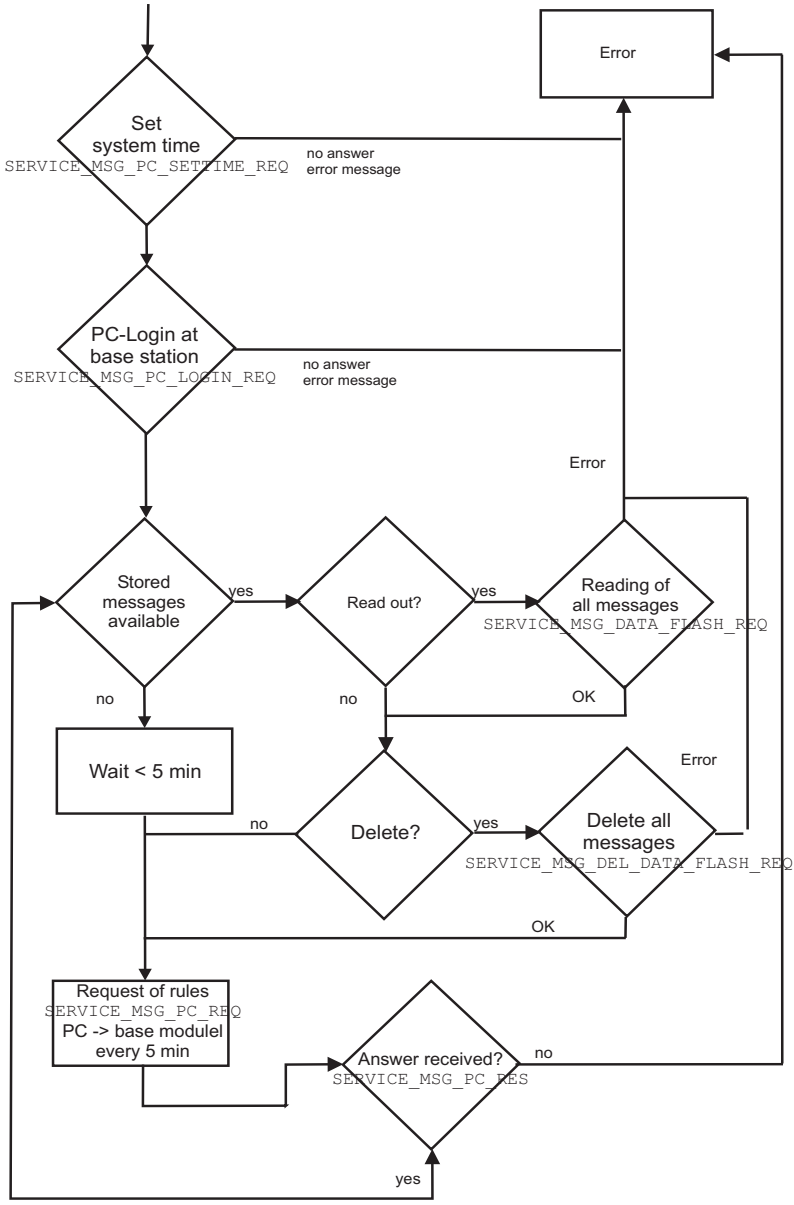


Fig.: Login

PC		Base module	
Setting the system time			
SERVICE_MSG_SET_TIME_REQ		SERVICE_MSG_SET_TIME_RES	
:00FF01910125D7C842F2	->		
	<-	:00FF25D7C84208011003C	
		Address: 65280 04.07.2005 08:28:53 Sequence no: 8 Number of Msg: 1 Message Type: 0x11 CRC: 0x3C Command executed successfully	00FF 25D7C842 08 01 11 3C
Login of the PC at the base module			
SERVICE_MSG_PC_LOGIN_REQ		SERVICE_MSG_PC_LOGIN_RES	
:00FF019DE7	->		
	<-	:00FF25D7C842090111D000A00AD	
		Address: 65280 04.07.2005 08:28:53 Sequence no: 9 Number of Msg: 1 Message Type: 0x1D State: OK – Base module ready Number of buffered messages in the Data Flash: 10	
Rule polling of the PC to the base module (repeat every <5 min)			
SERVICE_MSG_PC_REQ		SERVICE_MSG_PC_RES	
:00FF019F85	->		
	<-	:00FF25D7C8420A011F000A0053	
		Address: 65280 04.07.2005 08:28:53 Sequence no: 10 Number of Msg: 1 Message Type: 0x1F State: OK – Base module ready 10 buffered messages	

Fig.: Example Login

Logout procedure

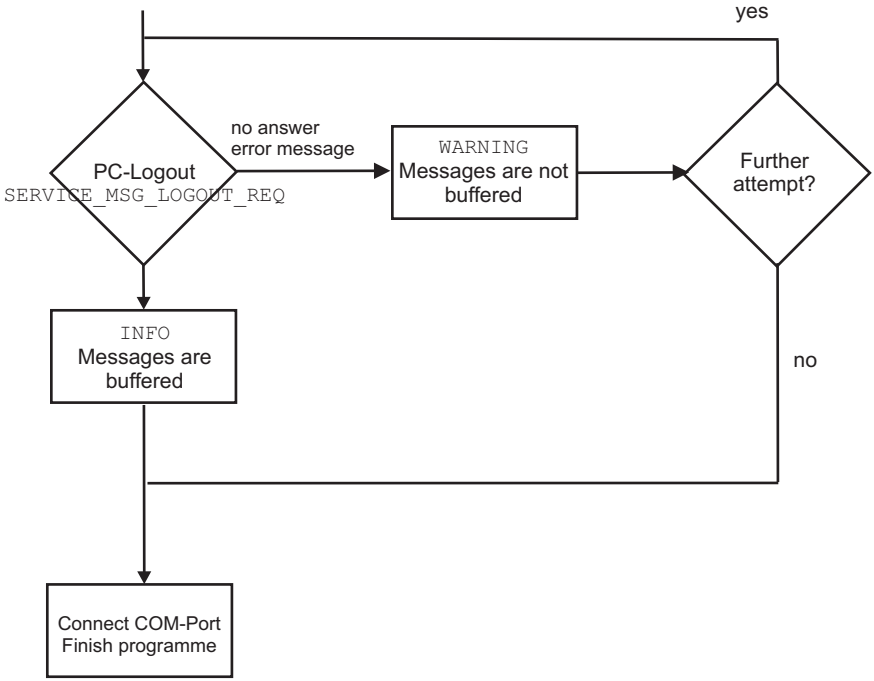


Fig.: Logout

Logoff of the PC from the base module		
SERVICE_MSG_PC_LOGOUT_REQ		SERVICE_MSG_PC_LOGOUT_RES
:00FF019EB4	->	
	<-	:00FF34D7C8420D011E002D
		Address: 65280 04.07.2005 08:29:08 Sequence no: 13 Number of Msg: 1 Message Type: 0x1E Buffering active

Fig.: Example Logout

CRC calculation

A check sum is added to every packet of data. This is a check value with which errors in the packet of data can be found out.
The basis of the CRC calculation is a table with 256 elements. By means of this table, the correct check sum is determined for every packet. The receiver controls the check sum by repeating the calculation for the packet of data and comparing this value with the transmitted CRC value. In case there are differences, it is assumed that it is a data error.
Following, you will find the CRC table as well as the function for calculating the check sum.

```
unsigned char crc8Table[256] =
{
  0, 49, 98, 83, 196, 245, 166, 151, 185, 136, 219, 234, 125, 76,  31,  46,
  67,  114, 33,  16,  135, 182, 229, 212, 250, 203, 152, 169, 62,  15,  92,  109,
 134, 183, 228, 213, 66,  115, 32,  17,  63,  14,  93,  108, 251, 202, 153, 168,
 197, 244, 167, 150, 1,   48,  99,  82,  124, 77,  30,  47,  184, 137, 218, 235,
 61,  12,  95,  110, 249, 200, 155, 170, 132, 181, 230, 215, 64,  113, 34,  19,
 126, 79,  28,  45,  186, 139, 216, 233, 199, 246, 165, 148, 3,   50,  97,  80,
 187, 138, 217, 232, 127, 78,  29,  44,  2,   51,  96,  81,  198, 247, 164, 149,
 248, 201, 154, 171, 60,  13,  94,  111, 65,  112, 35,  18,  133, 180, 231, 214,
 122, 75,  24,  41,  190, 143, 220, 237, 195, 242, 161, 144, 7,   54,  101, 84,
 57,  8,   91,  106, 253, 204, 159, 174, 128, 177, 226, 211, 68,  117, 38,  23,
 252, 205, 158, 175, 56,  9,   90,  107, 69,  116, 39,  22,  129, 176, 227, 210,
 191, 142, 221, 236, 123, 74,  25,  40,  6,   55,  100, 85,  194, 243, 160, 145,
 71,  118, 37,  20,  131, 178, 225, 208, 254, 207, 156, 173, 58,  11,  88,  105,
 4,   53,  102, 87,  192, 241, 162, 147, 189, 140, 223, 238, 121, 72,  27,  42,
 193, 240, 163, 146, 5,   52,  103, 86,  120, 73,  26,  43,  188, 141, 222, 239,
 130, 179, 224, 209, 70,  119, 36,  21,  59,  10,  89,  104, 255, 206, 157, 172
};


unsigned char calcCRC8(unsigned char *data)
{
  unsigned char i, crc;

  crc = 0;
  for(i = 0, i < len; i++)
    crc = crc8Table[crc ^ data[i]];

  return crc;
}
```

Maintenance and inspection

Keep the applicable regulations for the maintenance, service and control of appertaining equipment according to directives 1999/92/EG and EN 60079-17.

Repairs at explosion-proof equipment may only be carried out by authorized persons with original spare parts and according to state of the art.

The valid regulations for this have to be considered.

Base module

alpha WSN BM 110, BM 120, BM 130

Regularly mind that the antenna is fixed and that it is adjusted correctly.
An improperly adjusted or not fixed antenna decreases the efficiency of your wireless measurement system! Also see chapter "Antennas".

Sensor module

alpha WSN SM 240ex

Regularly mind that the antenna is fixed and that it is adjusted correctly.
An improperly adjusted or not fixed antenna reduces the efficiency of your wireless measurement system! Also see chapter "Antennas" for this topic.
Also pay attention to damages at the housing. A defect at the housing leads to an insufficient explosion protection!

alpha WSN SM 240

Regularly look out for damages of the PCB and / or of single components. Check the antenna connection as well as the sensor connection. Damages cause a reduction of the efficiency of your wireless measurement system up to the malfunction of the system. Also see chapter "Antennas" for this topic.

Repeatermodul

alpha WSN RM 300ex

Regularly mind that the antenna is fixed and that it is adjusted correctly.
An improperly adjusted or not fixed antenna reduces the efficiency of your wireless measurement system! Also see chapter "Antennas" for this topic.
Also pay attention to damages at the housing. A defect at the housing leads to an insufficient explosion protection!

alpha WSN RM 300

Regularly look out for damages of the PCB and / or of single components. Check the antenna connection as well as the sensor connection. Damages cause a reduction of the efficiency of your wireless measurement system up to the malfunction of the system. Also see chapter "Antennas" for this topic.

Maintenance

Base module alpha WSN BM 1x0

The base modules can be operated without maintenance.

Sensor modules alpha WSN SM 240ex and alpha WSN SM 240

The sensor modules can be operated without maintenance except for changing the battery.
You will find a detailed instruction for changing the batteries in the chapter "Battery change“.

Repeater modules alpha WSN RM 300ex and alpha WSN RM 300

The repeater modules can be operated without maintenance except for changing the battery.
You will find a detailed instruction for changing the batteries in the chapter "Battery change“.

Battery change

Although the modules of the wireless measurement system are very energy efficient and so a very long lifetime of the battery is achieved, it is from time to time necessary to change the battery. Please proceed as follows.
Please keep in mind that the battery is only changed outside of the explosion-endangered area!

Battery change housing version

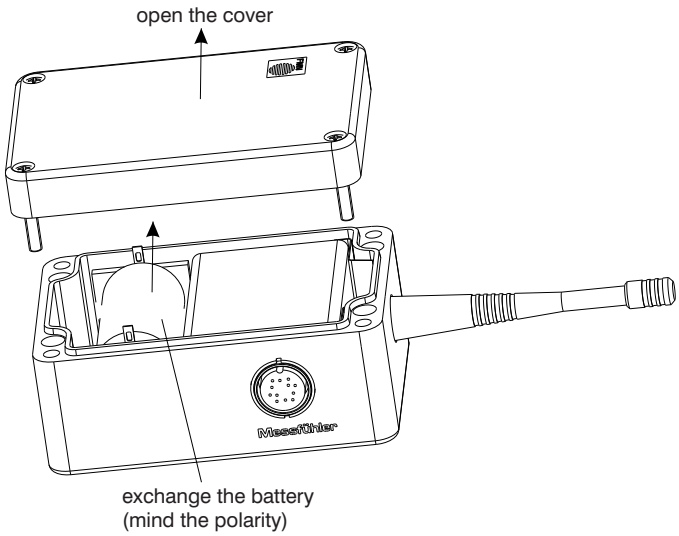


Fig.: Opened housing

1. Deactivate the module by removing the plug of the measuring cable or by loosening the contact between the pins E and F of the sensor interface.
2. Open the 4 screws of the cover and remove this.
3. Remove the exhausted battery by taking it out of the battery holder.
4. Insert the new battery. Mind the correct polarity (imprinted in the battery holder) as well as the use of the correct battery type (LR14; 3.6 V).

Battery change PCB version

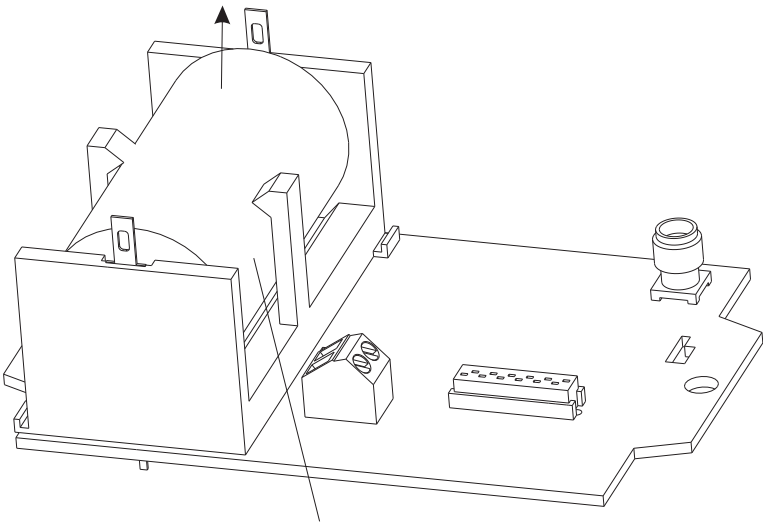


Fig.: PCB version

1. Deactivate the module by loosening the contact between the pins E and F of the sensor interface.
2. Remove the exhausted battery by taking it out of the battery holder.
3. Insert the new battery. Mind the correct polarity (imprinted in the battery holder) as well as the use of the correct battery type (LR14; 3.6 V).

Troubleshooting

Following, you will find instructions for troubleshooting at the wireless measurement system. In case the error could not be removed this way, please contact the manufacturer!

Base module alpha WSN BM 1x0

... at RS232 connection

- Check whether all cables are firmly attached (RS232, voltage supply).
- Check whether you have attached the RS232 cable. Is the correct COM-Port number set in the software?

... at USB connection

- Check whether the USB cable is firmly attached at the module and at the PC.
- Check the installation of the driver in the device manager under: START → Einstellungen → Systemsteuerung → System → Hardware → Geräte-Manager

... at LAN connection

- Check whether the LAN cable is firmly attached at the module and at the PC.
- Check the network settings in the system control under: START → Einstellungen → Systemsteuerung → Netzwerk- und DFÜ-Verbindungen
- Check the correct configuration of the LAN module BROWSER → IP address LAN module → Configuration → Network.
- In case the LAN module is not accessible, look for it by means of Discovery-Tool, also see chapter "Searching for modules by means of Discovery-Tool"

... at WLAN connection

- Check the network settings in the system control under: START → Einstellungen → Systemsteuerung → Netzwerk- und DFÜ-Verbindungen
- Check the correct configuration of the WLAN module BROWSER → IP address WLAN Module→ Configuration → Network.
- In case the WLAN module is not accessible, look for it by means of Discovery-Tool, also see chapter "Searching for modules by means of Discovery-Tool"

... voltage supply

- Check whether the plug of the power supply unit is firmly attached at the module.

... of the antenna

- Check whether the antenna is firmly attached.
- Check the position where the external antenna is mounted. The antenna radiator may in no case touch conductive parts (e. g. plates, heaters, cable, PC housings, etc.) or be shielded by these.

Sensor module alpha WSN SM 240ex and alpha WSN SM 240

… voltage supply

- Check the state of charge of the battery.
- If available: → Check whether the power supply unit is firmly attached at the module.

... of the antenna

- If available: → Check whether the antenna is firmly attached.
- Check the position where the external antenna is mounted. The antenna radiator may in no case touch conductive parts (e. g. plates, heaters, cable, PC housings, etc.) or be shielded by these.

Repeater module alpha WSN RM 300ex and alpha WSN RM 300

… voltage supply

- If available: → Check whether the power supply unit is firmly attached at the module.

... of the antenna

- Check whether the antenna is firmly attached.
- Check the position where the external antenna is mounted. The antenna radiator may in no case touch conductive parts (e. g. plates, heaters, cable, PC housings, etc.) or be shielded by these.

Antennas

When visibility is clear, ranges of up to 400 m are possible by means of standard antennas between the modules. By means of a gain antenna, receiving and transmitting properties of the wireless measurement system can be improved.
All antennas for the ISM band 868 MHz can be used in principle. Omnidirectional antennas with an antenna gain > 0 dBi are recommended. When purchasing an antenna, mind the required SMA plug at the connection cable.
The antenna radiator may in no case touch conductive parts (e. g. plates, heaters, cable, PC housings, etc.) or be shielded by these.
If possible, there should be a visual contact to the opposite station.
Mind that all antennas of the modules are operated in the same operating position (e. g. all antennas are standing vertically).
Electrical devices like computers etc. can generate interference fields that reduce the range.
If not given otherwise, the limits of the ETSI EN 300 220 and ETSI EN 301 489 will apply.

Technical data

General

Frequency range	869.85 MHz
Data rate at the radio interface	61.44 kbit/s NRZ
Range	max. 400 m in the free field, extension of the range by means of repeater operation or external antenna possible
Transmitting power (max.)	7 dBm
Type of modulation	GFSK
Receiver sensitivity	-100 dBm @ BER 10^{-3}
Intelligent power management	
Antenna connection	SMA socket
Temperature range storage	-40 °C ... +85 °C

Base module

Interfaces (as far as available)	RS232: max. data rate 115.2 kbit/s LAN: 10/100 Base T USB: max. data rate 921.6 kbit/s WLAN: IEEE 802.11b
Protection class housing	IP 20
Power supply unit socket (hollow plug)	- ○—◉—○ +, outside Ø 3.5 mm, inside Ø 1.35 mm
Supply voltage (external)	7.0 – 12.0 V, 500 mA
Supply over LAN (PoE)	802.3af mid span power pass - through
Potential-free alarm output	max. 30 V, 0.8 A
Temperature range operation	-10 °C ... +60 °C
Weight	approx. 270 g
Dimensions L x W x H approx.	115 x 106 x 32 mm

Technical data

Sensor module

Protection class housing version	IP 65; EX zone 21 (SM240ex)
Measuring value recording interval	10 s – 1 year
Measuring range temperature sensors	-40 °C ... +110 °C, resolution 0.1 °C, 6 channels
Accuray temperature measurement	typ. ±1.5 °C @ 20 °C, ± 2.5 °C in the whole temperature range
Temperature range operation	-25 °C ... +70 °C
Battery	lithiumthionylchlorid, 3.6 V, size LR14
Undervoltage alarm	< 2.85 V
Weight without / with battery	approx. 370 / 420 g
Dimensions L x W x H approx.	110 x 75 x 55 mm
Supply voltage PCB version	7 - 24 V

Repeater module

Protection class housing version	IP 65; EX-zone 21 (RM300ex)
Temperature range operation	-25 °C - +70 °C
Power supply with power supply unit	2-pole connecting terminal
Supply voltage (external)	7 – 24 V , 50 mA
Battery optional	lithiumthionylchloride, 3.6 V, size LR14
Weight	approx. 350 g
Dimensions L x W x H approx.	110 x 75 x 55 mm

Declaration of conformity

Herewith, the FMN communications GmbH declares that the wireless measurement system complies with the essential requirements and the other relevant provisions of the directive 1999/5/EG (R&TTE directive).
The complete declarations of conformity can be found in the Internet under http://www.fmncom.com.

Glossary

ASCII	**A**merican **S**tandard **C**ode for **I**nformation **I**nterchange
ESD	**E**lectrostatic **D**ischarge Static discharge
ETS	**E**uropean **T**elecommunication **S**tandard
GFSK	**G**aussian **F**requency **S**hift **K**eying (frequency modulation) Coding procedure for the data transmission
GMT	**G**reenwich **M**ean **T**ime
LED	**L**ight **E**mitting **D**iode
LSB	**L**east **S**ignificant **B**it
MSB	**M**ost **S**ignificant **B**it
OEM	**O**riginal **E**quipment **M**anufacture unit for the integration into a system
Polling	permanent polling concerning change in state
PWR	**P**ow**e**r (transmitting power)
RS232	**R**ecommanded **S**tandard **232** standardized serial interface
RXD	**R**eceive **D**ata Control character at the data transmission
Semiduplex	The data is successively transmitted in both directions (between transmitter and receiver), also called half-duplex connection.
Simplex	Data transmission that only goes in one direction (from transmitter to receiver)
TXD	**T**ransmit **D**ata Control character at the data transmission
USB	**U**niversal **S**erial **B**us Very fast serial data bus
WSN	**W**ireless **S**ensor **N**etworks
BM	Base Module
SM	Sensor Module
RM	Repeater Module

Glossary

LAN	**L**ocal **A**rea **N**etwork
WLAN	**W**ireless **L**ocal **A**rea **N**etwork
UART	**U**niversal **A**synchronous **R**eceiver / **T**ransmitter
IP	**I**nternet **P**rotocol
DHCP	**D**ynamic **H**ost **C**onfiguration **P**rotocol
ISM	**I**ndustrial, **S**cientific, **M**edical
SMA	**S**ub-**M**iniature-**A**
BER	**B**it **E**rror **R**ate
IEEE	**I**nstitute of **E**lectrical and **E**lectronics **E**ngineers
IP65	**I**nternational **P**rotection 65
PoE	**P**ower **o**ver **E**thernet

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